# Tra Terra e Mare

TIVAT

BULJARICA

ULCINJ

## Eco-guide to the lagoon ecosystems of Montenegro

Eko vodič za lagunske ekosisteme Crne Gore

Transitional waters are highly valuable patches in the coastal landscape and important sites for cultural and nature tourism. These rich and sheltered environments support dense populations of birds and form important habitat islands along migratory routes. Indeed, transitional waters are nursery habitats for many fish species, including species that are important for the fishing industry.

They also provide a number of less apparent or "hidden" services in the coastal zone which are important for the functioning of the biosphere. Transitional waters filter freshwater inputs, protecting the coastal environment and marine life, and they are a reserve of biodiversity, maintaining freshwater, marine and brackish species in a very restricted space.

The coast of Montenegro has high mountains very close to the sea, creating closed bays and marine gulfs. An impressively high freshwater discharge feeds the coastal environment, making these closed bays and gulfs brackish environments and thus real transitional waters.

In this guide, the author takes us on a journey to some of the most beautiful transitional waters of the Montenegrin coast: Tivat, Buljarica and Ulcinj. As a scientist specialising in ecology, he tells us what keeps these ecosystems functioning despite changes over time in terms of species density and modifications brought about by human beings. However, he is also driven by a real passion for nature, and he shows us the beautiful world of migratory birds in Montenegrin transitional waters, especially saline ecosystems. He makes us feel as if we were actually visiting these ecosystems in person, yet leaves us with a strong desire to go there and see them for real.

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OF ADRIATIC COASTAL GOVERNANCE:
ECOLOGY, MONITORING AND MANAGEMENT
OF TRANSITIONAL AQUATIC ECOSYSTEMS

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EKOLOŠKE OSNOVE ZA ZA UPRAVLJENJE
PODRUČJEM JADRANSKE OBALE:
EKOLOGIJA, MONITORING
I UPRAVLJANJE TRANZICIONIM VODENIM EKOSISTEMIMA

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# *Tra Terra e Mare*

Volume 2 - Drugi dio

Eco-guide to the lagoon ecosystems of Montenegro

Eko vodič za lagunske ekosisteme Crne Gore

*Nihil esse utilus sale et sole*
*Ništa nije korisnije od Sunca i soli*
*Nothing is as useful as the Sun and salt*
*Plinio*

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# Introduction

The European Union's Water Framework Directive (WFD), dealing with the conservation of water resources, introduced the term "transitional waters" to refer to aquatic ecosystems consisting of "*bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their proximity to coastal waters but which are substantially influenced by freshwater flows*". Transitional waters include a wide variety of ecosystems, such as estuaries, rias, fjords, fjards, coastal lagoons, bahiras, intermittently closing and open lakes and lagoons, river mouths, tidal creeks, deltas, salty ecosystems and saltpans. All of these ecosystems are characterised by the interaction between a freshwater force due to river flow and discharge, a sinusoidal marine force due to the tide, and an intermittent marine force due to wave action. The different relative strength of these three forces, together with coastal geomorphology, determines the variety of transitional water ecosystems and the internal habitat patchiness occurring in each transitional ecosystem type.

Due to their origin as the place where freshwater and seawater meet, the strength of the different forces and coastal geomorphology, transitional waters have a number of characteristics in common which make them highly valuable patches in the coastal landscape and impressive sites for cultural and naturalistic tourism. They also frequently have characteristics that are not found elsewhere. As a group of ecosystems, transitional waters are rich and sheltered habitats; they are very productive patches in the coastal landscape, supporting dense populations of birds and forming important habitat islands along migratory routes. They are also unique places for birdwatching.

Many of the birds colonising transitional waters eat fish, benefiting from the fact that transitional waters are ideal ecosystems for fish, particularly fish juveniles, which in these sheltered and highly productive waters find the conditions for optimal growth. Indeed, transitional waters are nursery habitats for many fish species, including species that are important for the fishing industry. Transitional waters also provide a number of less apparent, *hidden*, services in the coastal zone which are important for the functioning of the biosphere. They are unique places, where nitrogen compounds are reduced to molecular nitrogen and released back into the atmosphere, thus helping to maintain atmospheric composition over the last 400-500 million years. Transitional waters filter the freshwater inputs, protecting the coastal environment and marine life, and they are a reserve of biodiversity, maintaining freshwater, marine and brackish species in a very restricted space.

Birds are not the only vertebrates that benefit from the services supplied by transitional waters. Human societies have often developed around or inside transitional waters; Venice is a special case, but all Mediterranean coasts are dotted with human settlements linked to this ecosystem type. In many cases we also have historical records of past fishing activity and the importance of these ecosystems as a source of nutrient-rich trophic resources for human populations. Thus, transitional water

ecosystems are target sites for naturalist tourism but also unique places for cultural tourism, searching for early signs of human development. They have been the drivers of socio-economic development, and the evidence they provide of the 'responsible' behaviour of our ancestors shows us that real sustainability is both possible and necessary. Many transitional waters also have a number of distinct characteristics, depending on their origin and location in the coastal landscape.

Their characteristic flora and fauna can vary significantly from ecosystem to another. For example, the average similarity in the benthic invertebrates of Italian lagoons is less than 10%, suggesting two main conclusions: every lagoon has its own unique pattern of fauna, and biodiversity has to be protected at the EcoRegional level, since it is at this level that most biodiversity occurs. The transitional waters of Montenegro share these two general characteristics; they produce the typical services of transitional waters (and are thus highly valuable patches along the Montenegrin coasts), and they represent unique ecosystems within the Mediterranean coastal landscape.

Indeed, the coast of Montenegro has two major features which are not common to the rest of the Mediterranean coastal landscape: firstly it has high mountains very close to the sea, creating closed bays and marine gulfs; secondly, an impressively high freshwater discharge feeds the coastal environment, making these closed bays and gulfs brackish environments and thus real transitional waters. Boka Kotorska, the Kotor Gate, is the largest and most famous of these ecosystems along the coast of Montenegro, and is also one of the most attractive sites for tourists, given the combination of nature, culture and history. This combination is clearly not a product of chance but the organised result of humans living in symbiosis with ecosystems, taking advantage of their special features, as invertebrates, fish and birds still do. We can learn much by visiting a beautiful place like Kotor.

In this guide, the author takes us on a journey to some of the most beautiful transitional waters of the Montenegrin coast. As a scientist specialising in ecology, he tells us what keeps these ecosystems functioning despite changes over time in terms of species density and modifications made by human beings. However, he is also moved by a real passion for nature, and he shows us the beautiful world of migratory birds in Montenegrin transitional waters, especially saline ecosystems. He makes us feel as if we were actually visiting these ecosystems in person, yet leaves us with a strong desire to go there and see the place for real. Most of the pictures in the guide are by the author and they show us not only the places and species, but also the author's sense of love and respect for them, and in this sense he is an excellent guide for tourists.

Sustainability is a 'buzzword', since we learned somehow that we need to be sustainable; a journey through the transitional waters of the Mediterranean will show us in practice what sustainability is and what it requires, and as such for us is a journey into our future. We may yet become better inhabitants of our planet, but we have much to learn, and coastal Mediterranean lagoons are good teachers.

Alberto Basset

# Uvod

Okvirna Direktiva za vode Evrospke unije (WFD) koja ima za cilj zaštitu vodenih resursa nedavno je uvela termin „tranzicione ili prelazne vode" kako bi definisala vodene sisteme koji su "*površine pod vodom blizu rijeka koje mogu biti zaslanjene zbog blizine morske vode i koje su pod konstantnim uticajem dotoka slatke vode*". Tranzicione vode uključuju širok spektar ekosistema kao što su zalivi, fjordovi, obalne lagune, otvorena i jezera bez direktnog kontakta sa drugim vodama, delte, slatine i solane. Sve ove ekosisteme karakteriše interakcija između slatke vode i rijeka koje plave sa morskom vodom i djelovanjem plime i talasa. Različiti odnosi djelovanja poplava, plime i udara morskih talasa a u sadejstvu sa geomorfologijom terena determinišu različite tipove tranzicionih vodenih ekosistema i daju poseban pečat ovim vodenim staništima koja se nalaze unutar kopna.

Na osnovu njihovog porijekla, na mjestima miješanja slatke i slane morske vode a pod uticajem različitih sila i obalne geomorfologije, tranzicione vode ispoljavaju svoje specifične karakteristike koje daju visoke vrijednosti obalnom pejzažu kao impresivna staništa za organizovanje kulturnog i eko turizma sa svim svojim osobenostima. Cijela grupa ekosistema tranzicionih voda su bogata staništa i dobra skloništa: to su vrlo produktivni obalni habitati koji okupljaju značajne populacije vodenih ptica i koje postaju vrlo važne stanice tokom seobe ptica i jedinstvena staništa za njihovo posmatranje. Mnoge ptičje vrste zauzimaju ove habitate da bi se hranile ribom, čime koriste velike mogućnosti tranzicionih voda kao idealnih ekosistema za život u vodi, posebno riblje mlađi koja ih koristi kao dobra skloništa i hraništa za svoj rast i razvoj.

Ove vode su uistinu odgajališta mnogim ribljim vrstama, uključujući i one koje se koriste u industriji za proizvodnju hrane i prerađevina od ribe. Manje je poznato sa su ova staništa jako bitna za funkcionisanje cijele biosfere. Ovo su jedinstveni habitati u kojima se azotna jedinjenja transformišu u molekularni/gasni azot, čime se doprinosi konstantnom sastavu gasova atmosfere posljednjih 4-500 miliona godina. Tranzicione vode su filteri opterećenih slatkih voda koje štite obalnu prirodu i život u moru. To su jedinstveni rezervati biodiverziteta značajni za očuvanje brojnih slatkovodnih, brakičnih i morskih organizama. Ptice nijesu bile jedini kičmenjaci koji su koristili prednosti koje pružaju tranzicioni ekosistemi. I mi smo u punoj mjeri iskoristili njihove prednosti: razvoj ljudskog društva je koncentrisan na ili oko tranzicionih voda a grad Venecija je jedinstven primjer veze ljudskih naselja i ovakvih ekosistema. I ne samo ona, na cijelom Mediteranu ljudska naselja imaju veze sa ovim staništima.

Mnogo je primjera i istorijskih podataka da su ribarske aktivnosti vezane upravo za ovakve ekosisteme kao bogate izvore hrane za ljude. Dakle, tranzicioni vodeni ekosistemi su pogodno tlo za razvoj eko turizma ali i jedinstvena područja za razvoj kulturološkog turizma za one koji traže rane fakte o razvoju ljudskog društva kao vodećoj sili socio-ekonomskog razvoja i dokaze „odgovornog" ponašanja naših predaka, koji istinsku održivost čine potrebom više nego mogućim ishodom.

Tranzicione vode imaju svoje osobenosti u zavisnosti od njihove izvornosti i položaja u obalnom regionu. Karakteristike flore i faune u ovim ekosistemima mogu znatno da variraju. Samo jedan primjer potvrđuje pravilo: prosječna sličnost faune beskičmenjaka koja se nalazi u mulju ovih ekosistema u italijanskim lagunama iznosi manje od 10%, što navodi na dva glavna zaključka: svaka laguna ima jedinstvenu faunu a zaštitu biodiverziteta treba provoditi na regionalnom nivou.

Tranzicione vode u Crnoj Gori dijele ove dvije generalne karakteristike: one predstavljaju jedinstvene i visoko vrijedne habitate ne samo na crnogorskoj već i na mediteranskoj obali i produkuju sve ono što karakteriše tranzicione vode. U stvari, crnogorska obala ima dvije bitne prednosti koje se ne sriječu u mediteranskom obalnom pejzažu: jedna je da su visoke planine vrlo blizu mora a druga da stvaraju zatvorene zalive u kojima se vrši impresivno miješanje slatko slane vode koje čine uvale sa pravom brakičnom vodom tipičnom za tranzicione ekosisteme.

Boka Kotorska je najveći i najpoznatiji ovakav ekosistem na crnogorskoj obali koji postaje jedan od najatraktivnijih turističkih destinacija za one koji povezuju prirodu, kulturu i istoriju, koji razumljivo nije proizvod slučajnosti već organizovan rezultat našeg života u okviru ekosistema, koji koristi njegove osobenosti s obzirom da beskičmenjaka, riba i ptica još uvijek ima dovoljno. O ovome se može više čuti i vidjeti ako se posjeti mjesto kakav je prelijepi grad Kotor.

U ovom vodiču, autor nas vodi u šetnju crnogorskom obalom Jadrana na najljepše ekosisteme tranzicionih voda. Kao naučnik ekolog, on će nam ispričati pravu biološku priču koja ove ekosisteme još uvijek održava u funkciji uprkos promjeni vrsta u vremenu, promjeni njihove gustine naseljenosti i naše zbijenosti koja takođe modifikuje ekosistememe. Kakobilo, on je opsjednut prirodom i pticama i poveše nas u prelijepi svijet selica Crne Gore koje koriste tranzicione ekosisteme na svojoj seobi, naročito solane. On nas vodi u posjetu ovim ekosistemima kao da smo stvarno tamo i stavlja nam do znanja da ih i sami moramo posjetiti.

Većinu fotografija u ovom vodiču napravio je sam autor i one nam pokazuju ne samo ljepotu staništa i vrsta već i njegov osjećaj ljubavi i poštovanja prema njima. On je vodič u vodiču za nas turiste u ovim prelijepim mjestima. Održivost je jedna od 'vrućih riječi', odkad smo na neki način naučili da trebamo biti održivi; šetnja po tranzicionim vodama Mediterana će nam pokazati što je u stvari održivost i što ona zahtijeva na putu za budućnost. Mi možemo imati drugu šansu da budemo bolji žitelji naše planete ali treba da učimo. Mediteranske lagune nam mogu biti dobri učitelji kako to da izvedemo.

Alberto Basset

# Declaration concerning the ecological state of Montenegro


We, Members of Parliament of the Republic of Montenegro, are aware that in view of the threat to nature, protecting the identity of the land in which we live and work has become our most immediate and pressing task. Bearing in mind our debt to nature, which is a source of health and our inspiration for freedom and culture, we are devoting ourselves to its protection for the sake of our survival and the future of our posterity.

We recognize that all our differences are less important than the changes to the environment we live in. Regardless of our national, religious, political and other sentiments and convictions, we are fully aware that the dignity and wellbeing of a human being are intrinsically connected with the wellbeing and purity of nature. Human beings and the natural world around them are one in their depth, meaning and denotation.

Thus the abuse of man has always entailed the abuse of nature. Being committed to the struggle for the dignity of man, we are also called upon to struggle for the dignity of nature. By adopting this Declaration, Montenegro defines its attitude towards nature as a state policy and calls upon all people to show wisdom and prevent the impending ecological catastrophe.

*20. September 1991.* The Parliament of the Republic of Montenegro

# Deklaracija o ekološkoj državi Crnoj Gori

Mi, poslanici Skupštine Republike Crne Gore, svjesni smo da je, zbog ugrožavanja prirode, zaštita identiteta prostora na kome živimo i djelujemo postala naš neodložan i pravovremeni posao. Svjesni duga prema prirodi, izvoru našeg zdravlja i inspiraciji nase slobode i kulture, posvećujemo se njenoj zaštiti u ime sopstvenog opstanka i budućnosti potomstva.

Prihvatamo da ni jedna razlika medu nama nije toliko velika koliko su velike promjene kojima je izloženo nase prirodno okruženje. Bez obzira na naša nacionalna, vjerska, politička i druga ubjeđenja i osjećanja, znamo i prihvatamo da su dostojanstvo i svetinja ljudskog bića organski povezani sa svetinjom i čistotom prirode. Čovjek i priroda u njemu i oko njega cjelovito su jedno u svojim dubinama i po svom smislu i naznac´enju.

Stoga je oduvijek zloupotrebu čovjeka pratila zloupotreba prirode. Zato opredjeljujući se i boreći se za dostojanstvo čovjeka pozvani smo da se borimo i za dostojanstvo prirode. Donošenjem ove Deklaracije, Crna Gora prema prirodi uspostavlja državni odnos i poziva na mudrost sve ljude da spriječe ekološku katastrofu koja nam prijeti.

20. septembar 1991. Skupština Republike Crne Gore


The sea and seashore
of Montenegro

## THE SEA AND SEA SHORE OF MONTENEGRO

Montenegro's coastline is 310 km long, and belongs to six municipalities: Herceg Novi, Kotor, Tivat, Budva, Bar and Ulcinj. The area along the coast (the coast in this sense being the area bathed by the highest wave during the worst storm), together with the ports, dikes, rocks, bathing places, springs, river mouths, channels connected to the sea, the sea floor and undersea area and the whole course of the Bojana River in Montenegrin territory are managed by one, state-owned company: "Morsko Dobro Crne Gore" (Montenegro Coastal Zone Authority). In Ulcinj, it covers a strip wider than 1 km. 8 islands and 6 shoals, 31 rocks and 4 cliffs, along with 25.6 km of the coastline, are the property of the Montenegro Coastal Zone.

There are 117 beaches on the Montenegrin Adriatic coast, with a total length of 73 km. The water quality of the 55 most attractive beaches during the summer season is class I or II. Only rarely, in some micro-locations, is it class III, i.e., not suitable for bathing. Pollution of sea water mainly comes from fecal waste.

## COASTAL CLIMATE

July and August are the warmest months, with average daily temperatures above 30°C. Winters are warmer than in the hinterland: the minimum air temperature on the coast is on average 5°C.

The number of summer days on the coast, i.e., those with a maximum daily temperature of 25°C and above, is on average more than 110 a year (summer days have also been recorded during March). The maximum number of summer days is recorded in Tivat - 113.3 and the minimum is recorded in Bar - 97.4 days. There are on average 30 tropical days per year, when the maximum daily temperature reaches 30°C and above. There are 10 frosty days, when the minimum daily temperature goes below 0oC, on average per year, and they are recorded in the period December - March.

The sunshine record is good, with an average of 2,455 hours annually. Ulcinj, the southern-most town on the Montenegrin Adriatic coast, has 2,567 hours of sunshine and is the sunniest town in Montenegro. 40% of total annual sunshine on the coast is recorded in the summer months.

## MORE I MORSKA OBALA CRNE GORE

Crna Gora ima 310 km dugačku obalnu liniju sa šest opština koje na nju izlaze: Herceg Novi, Kotor, Tivat, Budva, Bar i Ulcinj. Područjem uz obalu (obala je u ovom smislu područje koje kvase najveći talasi za vrijeme najjačeg nevremena), kao i lukama, nasipima, hridima, kupalištima, izvorima, ušćima rijeka, kanalima spojenim sa morem, podmorjem i morskim dnom, kao i cijelim tokom rijeke Bojane na teritoriji Crne Gore gazduje jedno preduzeće u državnom vlasništvu - Morsko dobro Crne Gore. Ono u Ulcinju zahvata pojas širi od jednog kilometra. Morskom dobru pripada: osam ostrva i šest školja, 31 hrid i četiri grebena. Njihova obalna linija iznosi 25,6 km.

Ukupna dužina plaža na crnogorskoj obali Jadrana iznosi 73 km a njihov broj 117. Na najatraktivnijih 55 plaža, tokom ljetnje turističke posjete, voda je izmedju I i II klase, rijetko, samo na mikrolokalitetima, ona prelazi u III klasu tj. u vodu koja nije za kupanje. Zagađenje morske vode potiče uglavnom od bakteriološkog opterećenja zbog fekalnog otpada.

## KLIMA U PRIOBALJU

Jul i avgust su najtopliji mjeseci u godini sa dnevnom temperaturom iznad 30°C. Zime su toplije nego u unutrašnjosti: srednja minimalna temperatura vazduha na obali iznosi u prosjeku 5°C.

Ljetnjih dana, kada najviša dnevna temperatura dostigne 25°C i više, na primorju u prosjeku bude više od 110 godišnje (i tokom marta mjeseca registrovana je pojava ljetnjih dana). Najveši broj ljetnjih dana je u Tivtu: 113.3, a najmanji u Baru: 97,4 dana. Tropskih dana, kada najvića dnevna temperatura dostigne 30°C i više, na primorju u prosjeku godišnje ima oko 30. Tropski dani su registrovani uglavnom u junu, julu i avgustu. Mraznih dana, kada se najniža temperatura tokom 24 h spusti ispod 0°C, na primorju prosječno ima oko 10 godišnje, a javljaju se u periodu decembar - mart.

Insolacija je jaka, u prosjeku 2455 sati godišnje. Ulcinj, najjužniji grad na crnogorskoj obali Jadrana ima 2567 sunčanih sati i najosunčaniji je u Crnoj Gori. 40% ukupne godišnje insolacije na obali bilježi se tokom ljetnjih mjeseci.

## SEA CHARACTERISTICS

The average annual sea temperature along the Montenegrin coast is 17.9°C. In the coolest period of the year, January - March, the average temperature is 12°C. In the warmest period, June - August, the average maximum temperature is 23°C. During the summer months, daily water temperatures can reach 30°C. The salinity of the sea water along the coast is on average 38.50‰, while in the open sea it reaches 39‰.

The sea colour 90% of the time is blue or blue-green depending on cloudiness, the nature of the sea floor and the vegetation along the coast. It changes only in the part of the shore which is influenced by the Bojana River where it is yellow-green to dark yellow. Water on the high seas of the southern Adriatic is characterized by deep indigo to dark blue. Sea currents in the Adriatic have a maximum speed of 42 cm/s (incoming current along the Montenegrin shore) to 88 cm/s (outgoing current along the Italian shore).

The transparency of the sea water along most of the inshore area of Montenegro reaches to the floor, except in the part exposed to the influence of the Bojana River. Transparency increases towards the high seas. Thus in the center of the aquatorium it reaches the maximum of 60 m. The deepest point of the Adriatic is off the coast of Montenegro, with a depth of 1,340 m.

## KARAKTERISTIKE MORA

Srednja godišnja temperatura mora uz Crnogorsko primorje je 17,9°C. Najhladniji period godine januar-mart ima srednju temperaturu oko 12°C. U najtoplijem periodu, jun-avgust, srednja maksimalna temperatura iznosi 23°C. Dnevne temperature vode tokom ljetnjih mjeseci dolaze i do 30-tog podioka. Salinitet morske vode uz obalu iznosi, u prosjeku, do 38,50‰, dok je na otvorenom moru i do 39‰.

Boja mora je u 90% slučajeva plava ili plavo-zelena, u zavisnosti od oblačnosti, prirode dna i vegetacije uz obalu. Mijenja se samo na dijelu obale koji je u području uticaja rijeke Bojane gdje je žuto-zelene do tamno žute boje. Izrazito modra do tamno plava boja karakteriče vode na pučini. Morske struje Jadrana imaju najveće brzine od 42 cm/s (ulazna struja, uz crnogorsku obalu) do 88 cm/s (izlazna struja, uz italijansku obalu).

Providnost mora na najvećem dijelu priobalja Crne Gore seže do dna, izuzev na dijelu izloženom uticaju rijeke Bojane. Prema pučini providnost se povećava, da bi u središnjem dijelu akvatorijuma dostigla najveće vrijednosti, do 60 m. Najveća dubina Jadrana se nalazi naspram obale Crne Gore i iznosi 1340 m.

## HYDROLOGY OF TERRESTRIAL WATERS

The Montenegrin coast is rich in terrestrial waters. Montenegro in general, especially its southern part belonging to the Adriatic watershed, is one of the richest areas in the world in water. On average 604 $m^3/s$ of water flows from its territory. This amount of outflow is found on only 2-3% of the earth's surface. The Bojana River, with 640 $m^3/s$ at high water-level, is at the top of the scale in terms of its input to the Mediterranean, along with the Nile, Rhone and Po.

## BIOMASS PRODUCTION

Unlike the central and northern Adriatic, where production of nutritious salts, primarily nitrates and phosphates, is larger and leads to larger production of plankton, the southern Adriatic is a medium-productive zone. Numerous factors influence the concentration of nutritious salts. The most important are the geomorphological features of the basin, sunshine, currents, winds, and the inflow of freshwater from the continent.

It is estimated that the open sea of the southern Adriatic belongs to the A zone (primary production of 55 $grC/m^2$/annually), coastal waters belong to the C zone while Boka Kotorska Bay and the area around the mouth of the Bojana River belong to the D zone (over 150 $grC/m^2$/annually).

Marine flora and fauna depend directly and indirectly on the production of phyto- and zoo-plankton. Research by the Institute for Marine Biology in Kotor (Montenegro) has confirmed high amounts of primary production and saturation with phytoplankton biomass. This mainly consists of silicate alga belonging to the Nitzschia and Dinoflagelata orders. Copepoda account for 80% of the total zooplankton mass.

The highest amounts of zooplankton, an important nutrition factor for the majority of marine organisms in all stages of life, are reached in spring as a result of the mixture of open sea and coastal waters. The most numerous Copepoda species in the southern Adriatic is *Ctenocalanus vanus*, which is also the most common Adriatic species followed by *Centropages typicus* and *Temora stylifera*, together with numerous species of the Oithona order.

## HIDROLOGIJA KOPNENIH VODA

Područje Crnogorskog primorja je bogato kopnenim vodama. Crna Gora u cjelini, a posebno njen južni dio koji pripada Jadranskom slivu, spada među vodom najbogatija područja u svijetu. Sa njene teritorije otiče u prosjeku 604 $m^3/s$ vode. Ovoliko ili veće oticanje se u svijetu javlja na manje od 2-3 % površine kopna. Rijeka Bojana sa 640 $m^3/s$ pri visokom vodostaju je po izdašnosti koju daje mediteranskom moru na vrhu ljestvice, uz Nil, Ronu i Po.

## PRODUKCIJA BIOMASE

Za razliku od srednjeg i sjevernog Jadrana, gdje je produkcija hranjivih soli, u prvom redu nitrata i fosfata veća i omogućava veću produkciju planktona, južni Jadran spada u srednje produktivne zone. Na koncentracije hranjivih soli utiču brojni faktori i među najvažnije se ubrajaju geomorfološke karakteristike basena, insolacija, struje, vjetrovi, kao i slatkovodne dotoke sa kopna.

Procjenjuje se da otvoreno more južnog Jadrana spada u zonu A (primarna produkcija 55 $grC/m^2/god$), priobalne vode u zonu C (60 $grC/m^2/god$), a Bokokotorski zaliv i područje oko ušća Bojane u zonu D (preko 150 $grC/m^2/god$).

Flora i fauna mora zavise direktno ili indirektno od produkcije fito i zooplanktona. Istraživanjima Instituta za biologiju mora iz Kotora potvrđene su visoke vrijednosti primarne produkcije i zasićenje fitoplanktonskom biomasom. Nju uglavnom čine silikatne alge iz rodova *Nitzschia* i *Dinoflagelata*. Kad je u pitanju zooplankton, čine ga uglavnom *Copepoda*, koje čine 80 % ukupne mase zooplanktona.

Najveće vrijednosti zooplanktona, značajnog činioca ishrane većine morskih organizama u svim stadijumima dostižu se u proljeće kao rezultat miješanja vode otvorenog mora i priobalja. Među *Copepoda* južnog Jadrana najbrojnija vrsta je *Ctenocalanus vanus*. To je ujedno i najzastupljenija jadranska vrsta koju slijede *Centropages typicus* i *Temora stylifera*, te brojne vrste roda *Oithona*.

# Bio-resources of the southern Adriatic

The quantitative and qualitative composition of organisms used in food or other industries, such as fish, molluscs and crustaceans, is still on the level of assumptions. The only available data are collected by sea-bottom trawling (fishing). Based on this type of data, the structure in the sea is as follows: 37.3% Elasmobranchii (cartilaginous fish such as sharks, rays, etc), 59.1% Osteichthyes (bony fish), 3.5% molluscs (Cephalopoda, octopus, squid, etc,) and around 0.01% crustaceans (Crustacea, shrimps, lobsters, crabs, etc.).

Kvantitativno - kvalitativni sastav organizama koji se koriste u prehrambenoj ili nekoj drugoj industriji: ribe, mekušci, rakovi, i pored intenzivnih istraživanja, ostale su na nivou procjene. Jedini podaci dobijaju se povlačenjem koče po dnu mora. Stanje u moru na osnovu kočarenja je sljedeće: 37,3% morske divljači (*Chondrichtyes*, hrskavičave ribe, ajkule, raže...), 59,1% košljoriba (*Osteichthyes*), 3,5% glavonožaca (*Cephalopoda*) i oko 0,01 % rakova (*Crustacea*).

## POPULATION

The proportion of the total population of Montenegro living in the coastal area is increasing. The coastal population is growing much faster than the population in other parts of the country, mainly due to migrations. The largest population growth, therefore the largest pressure on resources, is recorded in Budva. 70% of the coastal population lives within 1 km of the coastline, with 84.6 inhabitants per km$^2$. More than 95% of all weekend apartments are located within 5 km of the shore. This situation illustrates the enormous pressure on space.

## TOURISM

According to data from the National Tourism Organization, during 2007 Montenegro hosted more than 1,150,000 tourists, with 1,000,500 foreigners, making 7,300,000 overnight stays. The highest number of tourists come from Serbia, 37%; the European Union accounts for 26% and Russia 12%. The revenue from tourism increased by 39% compared to 2006, while for 2008 the planned growth in the number of tourists is 10% and in revenue 14.5%. Considering that the majority of tourists are located on the 300 km of Montenegrin Adriatic coastline, and that their presence is intensified during summer, one can imagine the pressure on resources, coastline, sea and nature.

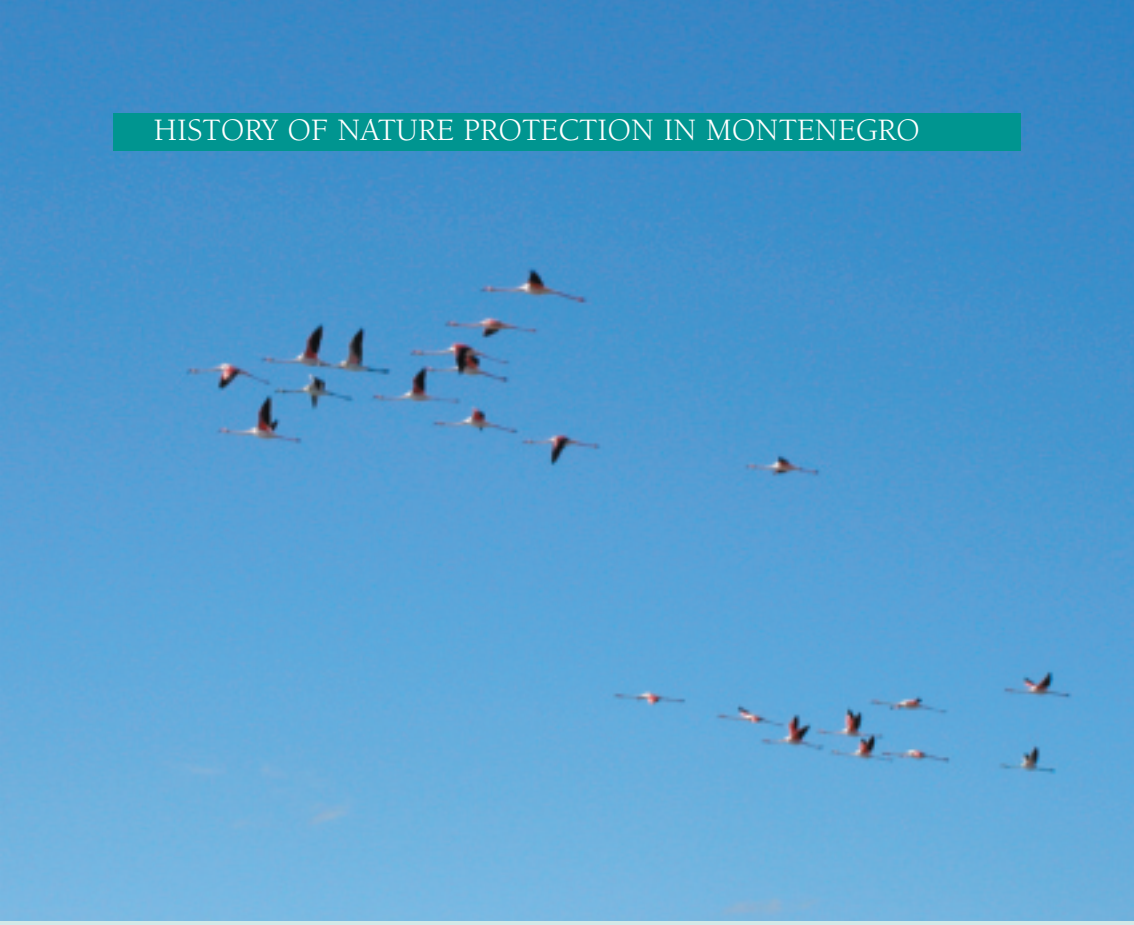
## STANOVNIŠTVO

Udio stanovništva iz primorja u ukupnom stanovništvu države je u porastu. Primorska populacija raste znatno brže od populacija koje se nalaze u drugim krajevima Crne Gore, uglavnom zbog migracija. Najveći rast broja stanovnika a samim tim i pritisak na resurse bilježi grad Budva i Budvanska rivijera. U zoni do 1 km od obalne linije naseljeno je oko 70% svih stanovnika primorja sa 84,6 stanovnika po km$^2$. Više od 95% svih vikend stanova smješteno je u zoni do 5 km od obale. Ovakva situacija govori o enormnom pritisku na prostor.

## TURIZAM

Prema podacima Nacionalne turističke organizacije, u Crnoj Gori je tokom 2007. godine boravilo više od 1.150.000 turista, od čega oko 1.000.500 stranaca, koji su ostvarili 7.300.000 noćenja. Najviše turista dolazi iz Srbije, 37%; Evropske Unije 26% i Rusije, 12%. Prihod od turizma porastao je u odnosu na 2006. godinu 39%, dok se za 2008. planira rast broja turista za 10% i prihoda za 14.5%. Ako se uzme u obzir da je najveći broj turista smješten na 300 km crnogorske obale Jadrana i da je njihovo prisustvo najintenzivnije tokom ljetnjih mjeseci, može se steći slika o pritisku na resurse, priobalje, more i prirodu.

# HISTORY OF NATURE PROTECTION IN MONTENEGRO



The earliest protected areas in Montenegro date back to the late 19th century when King Nikola declared hunting bans in some forest areas. He and his son, Crown Prince Danilo, used these areas for hunting with diplomats and other important guests who were officially visiting Montenegro at the time.

Half a century later, in 1968, the Institute for Nature Protection declared an act of protection concerning the ornithological reserves of Lake Skadar (Pančeva oka and Crni žar) and numerous beaches along the Montenegrin coast. At the same time, caves and some horticultural items were also protected.

The year 1952 was very important for nature protection in Montenegro. That year, three national parks were declared: Durmitor, Biogradska Gora and Lovćen. The list was extended in 1983 with Lake Skadar.

Since then, the nationally protected areas in Montenegro have not changed significantly, but it is important to mention the new protected nature areas on the Adriatic coast: Ulcinj Salina, which became the first private Nature Park in 2005 (still not protected by national legislation) and Tivat Salina, declared as a special flora-fauna reserve in 2007.

Of a total national area of 13,852 km$^2$, only 108,716 ha or 7.87% of the territory is protected by national legislation in Montenegro. Almost 6.20% of protected areas are within national parks in Montenegro, while the rest is considered to be "natural monuments" or landscapes with special natural characteristics.

Besides national protection, some areas are under UNESCO protection (such as Durmitor , the watershed of Tara canyon and Kotor Risan Bay). Lake Skadar is under RAMSAR protection, while some areas have been declared to be Emerald sites under the Bern Convention, Important Bird Areas (IBA) and important plant areas (IPA).

Regardless of the very low percentage of protected territory, there are many areas potentially worthy of protection; some of them have already been recognized and will be the subject of scientific interest in the coming period. However, there is a real danger that economic interest in their exploitation will act faster than the procedures to ensure their protection. This is especially true of the coast, mainly the economically and ecologically highly appreciated areas of Buljarica, Velika plaža and Ada Bojana.

## THE MOST IMPORTANT NATURAL HABITATS ON THE MONTENEGRIN ADRIATIC SHORE

Two lagoons are located near the Montenegrin coast: Tivat Salina and Ulcinj Salina, while right on the coast is Buljarica beach, 2.2 km long, with virgin hinterland. Velika plaža and Ada Bojana are also on the sea, but they will not be the subject of this guide, which does not mean that those beaches or their hinterland are less interesting or less attractive compared to the habitats described herewith.

Because our largest lagoons are saline, they are important for preserving the biodiversity and cultural heritage of the Mediterranean.

# ISTORIJAT ZAŠTITE PRIRODE U CRNOJ GORI

Prva zaštićena područja u Crnoj Gori datiraju s skraja 19. vijeka, kada je kralj Nikola pojedina šumska područja proglasio lovnim zabranima koja bi on ili njegov sin, prestolonasljednik Danilo, koristili za odlazak u lov sa diplomatskim korom ili visokim gostima koji su tada boravili u službenoj posjeti Crnoj Gori.

Pola vijeka kasnije, 1968. godine Zavod za zaštitu prirode donosi akto o proglašenju ornitoloških rezervata na Skadarskom jezeru (Pančeva oka i Crni žar), te brojnih plaža na Crnogorskom primorju. U tom talasu zaštite su se našle pećine i pojedini hortkulturni objekti.

Za zaštitu prirode Crne Gore značajna je 1952. godina, kada su proglašavena tri nacionalna parka: Durmitor, Biogradska gora i Lovćen. Spisku se 1983. godine pridružuje i Skadarsko jezero.

Do danas se nije značajnije promijenila površina nacionalno zaštićenih područja u Crnoj Gori, ali je važno napomenuti nove zaštićene objekte prirode na obali Jadrana: Ulcinjsku solanu, proglašenu prvim privatnim Parkom prirode 2005. godine (i dalje nezaštićenu nacionalnim zakonodavstvom) i Tivatska solila 2007. godine proglašena specijalnim florističko faunističkim rezervatom.

Od 13.852 km², koliko iznosi površina države, do sada je u Crnoj Gori zvanično zaštićeno nacionalnim zakonodavstvom 108.716 ha ili svega 7.87% teritorije. Gotovo 6.20 % zaštičenih površina je pod nacionalnim parkovima, dok je ostatak proglašen spomenicima prirode i predjelima posebnih prirodnih odlika.

Pored nacionalne zaštite, neki su predjeli pod zaštitom UNESCO (Durmitor i slivno područje kanjona Tare, Kotorsko-risanski zaliv); RAMSAR, Skadarsko jezero; a neki su proglašeni Emerald staništima Bernske konvencije, područjima od međunarodnog značaja za boravak ptica (IBA) i staništima od značaja za opstanak biljaka (IPA).

Bez obzira na jako nizak procenat zaštičene teritorije u ekološkoj državi, može se reći da potencijalno zaštičenih područja ima znatno više. Mnoga su već prepoznata i biće predmet interesovanja naučnika u periodu koji dolazi. Ipak, postoji realna opasnost da će ekonomski interes za njihovu eksploataciju biti znatno brži od procedura za njihovu zaštitu. To se prije svega odnosi na priobalje, u prvom redu na ekonomski i ekološki visoko vrijedna područja: Buljaricu, Veliku plažu i Adu Bojanu.

## NAJZNAČAJNIJA PRIRODNA STANIŠTA NA CRNOGORSKOJ OBALI JADRANA

U zaleđu plaža Crnogorskog primorja nalaze se dvije lagune: Tivatska solila i Ulcinjska solana, a na samoj obali 2.2 km dugačka plaža Buljarica sa djevičanskim zaleđem. Uz more se nalaze Velika plaža i Ada Bojana, ali njihove prirodne vrijednosti neče biti predmet obrade u ovom vodiču, što ne znači da je posjeta ovim plažama, a posebno njihovom zaledu, manje interesantna i atraktivna u odnosu na ovdje opisana staništa.

Obzirom da su naše najveće lagune solane, predstavljamo njihov značaj za očuvanje biodiverziteta i kulturne baštine Mediterana.

## THE MOST IMPORTANT ECOSYSTEMS IN THE COASTAL AREAS OF MONTENEGRO
## NAJZNAČAJNIJI EKOSISTEMI CRNOGORSKOG PRIMORJA

| NAME<br>NAZIV | E | N | PROVINCE<br>OPŠTINA | AREA<br>POVRŠINA<br>(ha) | PERIMETER<br>OBALA<br>(km) | MAX<br>DEPTH<br>DUBINA (m) |
|---|---|---|---|---|---|---|
| Bokokotorski zaliv | 18°39' | 42°25' | Kotor, Herceg Novi, Tivat | 8,730 | 105.7 | 62 |
| Tivatska solila | 18°42' | 42°23' | Tivat | 150 | 6.7 | 0.40 |
| Buljarica | 18º58' | 42º11' | Budva | 300 | 5.3 | 1.40 |
| Ada Bojana | 19°21' | 41°51' | Ulcinj | 494 | 9.5 | 0,60 |
| Rijeka Bojana | 19° 20' | 41° 54' | Ulcinj | | 22.8 | 8 |
| Ulcinjska Solana | 19°18'5 | 41°51' | Ulcinj | 1,492 | 18.7 | 0.80 |
| Velika plaža | 19°17' | 41°53' | Ulcinj | 1,235 beach/plaža<br>993 delta/prodelta | 12 | 1.20 |

* IBA - Područje od međunarodnog značaja za boravak ptica / Important Bird Area
* EMERALD - stanište divlje flore i faune na osnovu standarda Bernske konvencije/site under Bern Convention
* IPA - Područje od međunarodnog značaja za biljke u Crnoj Gori / Important Plant Area
* UNESCO - Svjetska kulturna baština / World Cultural Heritage

Područja koja su na samoj obali i imaju kontakt sa morem ispisana su italicom
Area on the coast and in contact with the sea are in italics

| NAME AND NATIONAL CATEGORY OF PROTECTED AREAS IN COASTAL ZONE / NAZIV I NACIONALNA KATEGORIJA ZAŠTIĆENIH PODRUČJA PRIRODE NA OBALI CRNE GORE | AREA POVRŠINA (HA) | *IBA | *EMERALD | *IPA | *UNESCO |
|---|---|---|---|---|---|
| | | | | | |
| *Nature Reserves / Rezervati prirode* | | | | | |
| *Tivat Salina / Tivatska solila* | 150 | X | X | | |
| *Natural Monuments / Spomenici prirode* | | | | | |
| *Velika Ulcinjska plaža* | 600 | | | X | |
| Botanicki rezervat lovora i oleandera, iznad vrela | | | | | |
| Sopot, Risan | 40 | | | | |
| Savinska Dubrava, Herceg Novi | 35.46 | | | | |
| Gradski park, Tivat | 5.897 | | | | |
| *Bečićka Plaža* | 5 | | | | |
| *Plaža Sutomore* | 4 | | | | |
| *Buljarica* | 4 | X | | | |
| *Plaža Sveti Stefan* | 4 | | | | |
| *Slovenska plaža, Budva* | 4 | | | | |
| *Jaz* | 4 | | | | |
| *Plaža Čanj* | 3.5 | | | | |
| *Plaža Valdanos* | 3 | | | | |
| *Plaža Topolica, Bar* | 2 | | | | |
| *Plaža Mogren* | 2 | | | | |
| *Plaža Pržno* | 2 | | | | |
| Park Dvorca na Topolici, Bar | 2 | | | | |
| *Mala Ulcinjska plaža* | 1.5 | | | | |
| *Plaža Pećin* | 1.5 | | | | |
| *Petrovačka plaža* | 1.5 | | | | |
| Park kod hotela Boka, Herceg Novi | 1.2 | | | | |
| *Plaža Drobni pijesak* | 1 | | | | |
| *Plaža Miločer* | 1 | | | | |
| *Paza Lučica, Petrovac* | 0.9 | | | | |
| *Plaža Velji pijesak* | 0.5 | | | | |
| *Areas of special natural features / Predjeli posebnih prirodnih odlika* | | | | | |
| Brdo Spas, Budva | 131 | | X | X | |
| *Poluostrvo Ratac sa Žukotrljicom* | 30 | | | | |
| *Ostrvo Stari Ulcinj* | 2.5 | | | | |
| *Areas protected by municipal statute / Podružja zaštićena opstinskim odlukama* | | | | | |
| *Kotorsko - Risanski zaliv* | 15 | | | | X |
| | | | | | |

# So, *salt, salarium* salary, salarie

Many saltpans on the Mediterranean have more than 1000 years of history. Throughout history, saltpans have not been just salt factories; many states, towns, churches and families have based their power on the salt production and trade.

Previously, salt was an asset and a commodity. Thanks to its previous value, today in some European languages a person's monthly income is still called *salarium* or *salary*. Naturally, the words have the same origin as "salt".

The old German coin made of salt crystals was called a "*heller*". Many towns in German-speaking areas which once had salt mines contain the word for "salt" in their name, e.g.: *Schweizerhalle, Hallstatt, Friedrichhalle, Reichenhall*. Previously, the name for goods traded for salt was "*sold*".

## WITH A GRAIN OF SALT (*Cum grano salis*)

Salt is very important for the functioning of organisms. Many philosophers used it in their sayings and writings, as it is so important for the survival of living creatures. It is also mentioned in the Bible: "With all thine offerings thou shalt offer salt". Salt is used for preventing food contamination.

Therefore it is used in sayings as a symbol for purity. Thus Christ, calling on the people to practice moderateness and reject depravity, says: "You are the salt of the earth. But if salt loses its taste, with what can it be seasoned?" The ancient Greeks used to say: "nothing is more useful than Sun and salt."

Veliki broj solana na Mediteranu ima više od 1000 godina staru istoriju. Solana kroz vjekove nije bila samo fabrika soli: mnoge države, gradovi, crkve i familije zasnivale su svoju moćna bogatstvu solju i njenoj prodaji.

Ranije je so bila kapital i jedan od glavnih prodajnih artikala. Zahvaljujući njenoj nekadašnjoj vrijednosti, danas se u nekim evropskim jezicima zadržalo da se za mjesečna primanja kaže *salarium* ili *salary*. Naravno, riječi vode porijeklo od riječi „so".

Stari njemački kovani novac izrađen od slanih kristala nosio je naziv "*heller*". Brojni gradovi a bivši rudnici njemačkog govornog područja, u osnovi naziva imaju riječ „so": *Schweizerhalle, Hallstatt, Friedrichhalle, Reichenhall*. U prošlosti za robu koja je zamijenjena za so govorilo se "*sold*".

## SA ZRNOM SOLI (*cum grano salis*)

So je veoma bitna za funkcionisanje organizma. Toliko važnu za opstanak živih bića mnogi su filozofi koristili u svojim izrekama i pisanjima mudrosti. Ona se pominje i u Bibliji: "Svaki dar koji prinosiš - osoli...".

So se koristi za sprečavanje kvarenja hrane. Zato se koristi u izrekama kao simbol za čistinu. Tako Hrist, pozivajući narod na umjerenost i neiskvarenost kaže: "Vi ste so zemlji, ako so obljutavi, čime će se osoliti?". Stari su Grci govorili da "ništa nije korisnije od Sunca i soli".

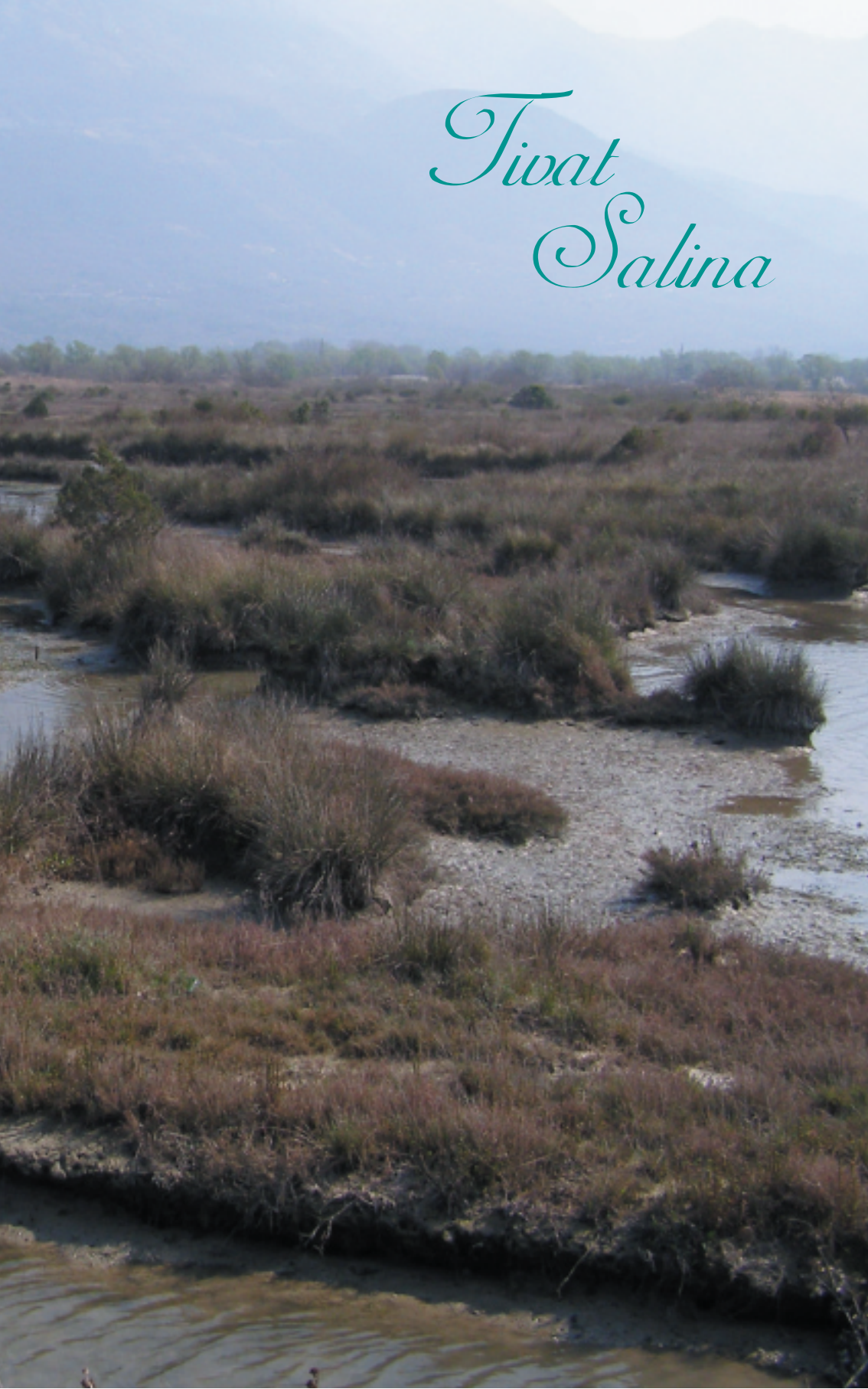

The importance of saltpans for the protection of biodiversity is reflected in the fact that around 75 percent of all European saltpans are protected. Besides the protection status exercised on the national level, many of them enjoy IBA status, based on the standards of the world wide authority for the protection of birds and their habitats, *BirdLife International*. Some of them are also included in the Ramsar List of Wetlands of International Importance. In all Greek saltpans, because of the importance they have for bird diversity, in particular during migration, hunting is banned.

Today, there are 6,500 km$^2$ of lagoons along the Mediterranean coast, 12,000 km$^2$ of lakes and natural wetlands and approx. 10,000 km$^2$ of artificial swamps, including saltpans. This is equivalent to the surface area of Sicily or Albania. Out of a total of 168 saltpans in 18 Mediterranean countries, 64 are inactive, 11 have been transformed into fish-farming ponds and brine shrimp nurseries, while 90 are still operational. 77% of them are on the European coast while the rest are located in Turkey, Tunisia, Algeria, Lebanon, Israel, Egypt and Morocco. The surface area of saltpans varies from 1 to 12.000 ha and they produce 7 million tons of salt annually.

## SOLANE NA MEDITERANU

Značaj solana za zaštitu biodiverziteta se odslikava u činjenici da je oko 75 odsto ukupnog broja evropskih solana zaštićeno. Mnoge od njih, pored statusa zaštite na nacionalnom nivou, uživaju status IBA na osnovu standarda svjetskog autoriteta za zaštitu ptica i njihovih staništa *BirdLife International*. Jedan dio je uvršten u Ramsarsku listu močvara od međunardnog značaja koja do danas broji više od 1700 vlažnih staništa na cijeloj planeti. Na svim grčkim solanama je, zbog značaja za diverzitet ptica a naročito pri seobi, zabranjen svaki lov.

Na Mediteranu danas postoji 6.500 km$^2$ laguna, 12.000 km$^2$ jezera i prirodnih bara i oko 10.000 km$^2$ vještačkih močvara, uključujući i solane. Ta površina je ekvivalentna površini Sicilije ili Albanije. Od ukupno 168 solana u 18 mediteranskih zemalja, 64 su neaktivne, 11 ih je transormisano u ribnjake i uzgajališta salamurskog račića Artemia, dok njih 90 radi. Na evropskoj obali nalazi se 77%, dok je ostatak lociran u Turskoj, Tunisu, Alžiru, Libanu, Izraelu, Egiptu i Maroku. Najveći broj evropskih solana nalazi se u Španiji, slijede Grčka, Italija i Francuska. Površina solana u Sredozemlju se kreće od 1 do 12.000 ha i godišnje daju 7 miliona tona soli.


Tivat
Salina

## GEOGRAPHICAL POSITION

The Tivat Salina is situated in the wetland part of the coastal strip of Boka Kotorska bay. 60 years ago, this area was designated as a saltpan, with basins, irrigation-drainage channel systems and communication dikes. Although it was constructed, it has never been used.

The saltpan is divided up into pools, each of which is approximately 3 hectares (150x200m) in size. The total area of the lagoon is 150 ha. Two rivers, the Široka and the Kološun, belong to the saltpan's catchment area.

### HOW TO ARRIVE

By plane: Tivat airport, http://www.aptivat.com, only 1 km away from Tivat Salina. Info: +382 82 670 960, 670 975; dispatch@aptivat.com

By car: main road Budva-Herceg Novi, 20 km away from Budva, 5 km from Tivat, 8 km from Kotora (via tunnel)

| TIVAT SALINA - TIVATSKA SOLILA | | | |
|---|---|---|---|
| | | Površina / Surface | 150 ha |
| E | 18°42'54.56" | Obala / Coast | 0.6 km |
| N | 42°23'36.59" | Dubina / Max depth | 0.40 m |

## POLOŽAJ


Područje Solila sa nalazi u močvarnom dijelu priobalnog pojasa Tivatskog zaliva i zahvata neiskorišćeno poplavno područje u predjelu Grbaljskog polja. Prije 60 godina je na tom području predviđena aktivacija solane, sa izgrađenim kristalizacionim bazenima, sistemima dovodnih - odvodnih kanala i komunikacionim nasipima.

Međutim, nije pošela sa radom. Solila su isparcelisana i površina svakog bazena iznosi oko 3 hektara (150x200m). Ukupna površina lagune je oko 150 ha. Slivu Solila pripadaju dvije rijeke: Široka i Kološun.

## KAKO DOĆI

AVIONOM: Aerodrom Tivat, http://www.aptivat.com, na svega 1 km od Tivatskih solila. Info: +382 82 670 960, 670 975; dispatch@aptivat.com

AUTOM: magistralni put Budva-Herceg Novi, 20 km od Budve, 5 km od Tivta, 8 km od Kotora (via tunel)

## MORE INFORMATION - VIŠE INFORMACIJA

http://www.birdwatchingmn.org http://www.morskodobro.com

http://www.tivat-info.com http://www.tivatonline.com

# Tivat Salina throughout history

The earliest data on the salt basins of Tivat Salina are found in medieval records, where its significance for the economy of Kotor is described. At that time, Kotor's prosperity was based on the production and trade of salt.

Articles regulating the production, import, export and trade of salt can be found in the town's statute. In 1683, when this area was under Ottoman occupation, the area of the present Salina was described as very important for salt production and it was stated that it created 81% of the local population's total income.

According to data from the historical archive, Tivat Salina always employed a number of salt workers for the preparation of bases, and construction of dikes, channels, outlets, etc. The salt harvest, which used to take place from April to October, involved the whole of the local working population and their beasts of burden. The area of Tivat Salina is recorded as a saltpan in all historical maps of the area.

## WATER, AIR, SOIL AND NOISE

Tivat Salina receives water from two rivers draining the Tivat fields - the Široka and the Kološun. They both receive industrial waste waters. However, the sea water is of good quality in Tivat Bay and never leaves class I. Kalardovo beach, right next to the saltpan has been awarded the "blue flag" eco certificate because of the high quality of its waters. The pure sea water near the saltpan is marked as a zone of special interest in the plans of the Montenegro Coastal Zone Authority, among other reasons because of the good water quality.

The air along most of the Montenegrin coastline is clean. Legal limits for smoke, ground-level ozone and minor sedimentary substances have occasionally been breached in the Tivat area. One can say that the air around the saltpan is clean, with occasional peaks in the concentration of some pollutants at a minimal level.

Soil quality has not been explored in the location of the saltpan. However, values for some pollutants in the Tivat fields and Tivat Airport have been monitored. In the period 2002-2005 an increase in the concentration of heavy metals, including chromium, nickel, cadmium and lead, was recorded.

Tivat Airport is located in the saltpan's contact zone. It has a large frequency of landings and take-offs, especially during the summer season when there are more than 60 planes a day (landings and take-offs). Air traffic at the airport has been increasing and it may possibly become open for night traffic as well.

# Tivatska Solila kroz istoriju

Prve podatke o slanim bazenima Tivatskih solila nalazimo u srednjovjekovnim spisima, kada se opisuje njen značaj za privredu susjednog Kotora, koji je svoj prosperitet dobrim dijelom temeljio na proizvodnji i prodaji soli. Čak se i Statutom ovog grada regulisala proizvodnja, uvoz, izvoz i prodaja soli.

Daleke 1683. godine, kada je ovo područje bilo pod turskom okupacijom, opisuje se da je područje na kome se danas nalaze Solila značajno za proizvodnju soli i da ona predstavlja 81% ukupnog prihoda lokalnog stanovništva.

Prema podacima iz istorijskih arhiva, rad na Solilima se uvijek odvijao pod budnim okom solara (pripremanje podloga, izgradnja nasipa, kanala, propusta) a berba soli, koja se odvijala od aprila do oktobra, uključivala je svo lokalno radno sposobno stanovništvo i tegleću stoku. Prostor Solila se kao solana nalazi na svim istorijskim kartama ovog područja.

## VODA, VAZDUH, ZEMLJIŠTE I BUKA

Tivatska solila primaju vodu od dvije rijeke koje dreniraju Tivatsko polje - Široka i Kolożun. Obje su opterećene industrijskim balastnim vodama. Za razliku od njih, voda mora u Tivatskom zalivu je dobrog kvaliteta i ne izlazi iz I klase. Plaža Kalardovo, koja se nalazi nadomak Solila, ima „plavu zastavicu“, eko sertifikat koji se dobija između ostalog i zbog kvaliteta morske vode. Čisto more ispred Solila je u planovima Morskog dobra označeno kao zona od posebnog interesa za razvoj marikulture.

Vazduh je na najvećem dijelu crnogorske obale u klasi čistog. Na području Tivta se registruju kratkotrajna prekoračenja graničnih vrijednosti dima, koncentracije prizemnog ozona i neznatno taložnih materija. Može se reći da je vazduh na Solilima čist sa minimalnim i povremenim prekoračenjima koncentracija pojedinih polutanata.

Kvalitet zemljišta na lokaciji Solila nije istraživan. Međutim, praćene su vrijednosti pojedinih polutanata u Tivatskom polju i na aerodromu Tivat, gdje je u periodu 2002-2005. godine zabilježeno povećanje koncentracija teških metala: hroma, nikla, kadmijuma i olova.

U kontaktnoj zoni Solila nalazi se Aerodrom Tivat sa velikom frekvencijom slijetanja i uzlijetanja, naročito tokom ljetnje sezone kada dnevno ova zračna luka opsluži više od 60 aviona (slijetanje i polijetanje), sa tendencijom porasta saobraćaja, eventualno otvaranja i za noćni saobraćaj.

# Natural characteristics

## FLORA AND VEGETATION

The area of Tivat Salina is characterised by vegetation populating halophyte wetlands. These are primarily meadows of *Salicornia* and *Limonietela*, *Juncetalia maritimi* and brackish water vegetation such as *Phragmitetalia*.

Since these complex types of natural vegetation on sludgy-clay grounds have already vanished in most of the habitats along the Eastern Adriatic coast, this site in particular is cited as having special ecological value.

The distribution of certain halophyte species participating in the construction of this vegetation in Montenegro is limited to this area and the Ulcinj Salina only. Therefore, the species registered for these two saltpans are protected by national legislation.

# Prirodne karakteristike

## FLORA I VEGETACIJA

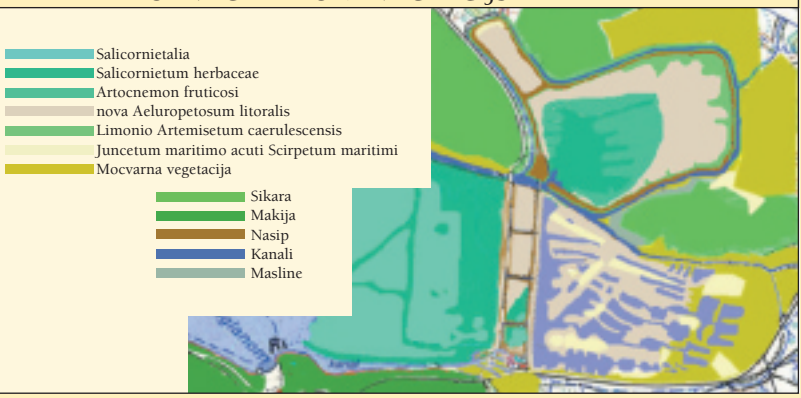
U flori i vegetaciji Crnogorskog primorja, područje Solila se prepoznaje po vegetaciji koja nastanjuje zaslanjena vlažna staništa. Radi se prvenstveno o livadama biljaka *Salicornia* i *Limonietela*, te vegetaciji *Juncetalia maritime* i vegetaciji slatko - slanih močvara *Phragmitetalia*. Kako su ovakvi kompleksni tipovi prirodne vegetacije na muljevito-glinovitoj podlozi već iščezli na većini staništa na istočnoj obali Jadrana, to se očuvanje kompaktnosti područja Tivatskih solila kao sigurnog staništa halofitne vegetacije ističe kao posebni ekološki izazov.

Rasprostranjenje pojedinih biljnih vrsta (halofite vrste) koje učestvuju u izgradnji ove vegetacije, u crnogorskim okvirima ograničeno je samo na Tivatska solila i područje Ulcinjske solane. Zbog ograničenog areala, one su zaštićene domaćim zakonodavstvom.

## IMPORTANT FLORA - ZNAČAJNI PREDSTAVNICI FLORE

| | |
|---|---|
| *Salicornia fruticosa* | *Salicornia herbacea* |
| *Suaeda maritima* | *Juncus acutus* |
| *Limonium angustifolium* | *Plantago maritima* |
| *Scirpus litoralis* | |

## MAP OF VEGETATION - VEGETCIJSKA KARTA




| HABITATS - STANIŠTA | PALEARCTIC HABITAT CLASSIFICATION<br>PALEARKTIČKA KLASIFIKACIJA STANIŠTA |
|---|---|
| *Mediterranean and thermo Altanthic salt meadows* | 15.5 |
| *Mediterranean Neomoral saltmars scrub* | 15.6 |
| *Mediterranean salt steppes* | 15.8 |

# FAUNA

*Emberiza cia*

## AMPHIBIANS AND REPTILES

14 species of amphibians and reptiles are registered for the territory of Tivat lagoon. Ten vulnerable and 3 endangered species are on the IUCN Red list of endangered species. All of these species show the need to conserve this lagoon in order to ensure their long-term survival.

Species of special interest for protection in Tivat Salina are the Skadar frog *Rana shqiperica* and the European legless lizard *Ophisaurus apodus*.

## BIRDS

The immediate vicinity of the sea and the well-preserved geomorphology of Tivat Salina Lagoon make it of special interest for birds. Shallow salty water rich in fish, and sludgy ground rich in benthic organisms, attract water birds for feeding, wintering and resting during autumn and spring migrations. Up until now, 47 species of birds associated with water habitats have been registered in Tivat Salina.

Lagoon. 4 of them are permanently present, approximately 35 are wintering and 6 are probably nesting. With other bird species such as passerines, raptors, etc., a total of 111 species of birds have so far been registered in Tivat Salina. However, the list is not even nearly complete because every year, a few new species for the area are registered.

Since 526 bird species have been registered in Europe to date, the number of birds present in this lagoon corresponds to 21% of the total species of European avifauna, which cannot be neglected. Special importance is given to at least 11 species from Annex I of the Birds Directive EU, and to several globally endangered bird species, such as the Pygmy Cormorant, *Phalacrocorax pygmeus*.

## VODOZEMCI I GMIZAVCI

Na području Tivatskih solila registrovano je 14 predstavnika vodozemaca i gmizavaca, od čega se na IUCN Crvenoj listi nalazi 10 ranjivih i 3 ugrožene vrste. Sve ove vrste dokazuju očuvanost ove lagune i njen potencijal da obezbijedi njihovo dugoročno preživljavanje.

Vrste od posebnog interesa za zaštitu na Tivatskim solilima su skadarska žaba *Rana shqiperica* i blavor, *Ophisaurus apodus*.

## PTICE

Neposredna blizina mora i prilično sačuvana geomorfologija ove lagune čine da ona bude od posebnog interesa za boravak ptica. Plitka slana voda bogata morskim organizmima i muljevitim dnom bogatim bentosom privlači vodene ptice na ishrani, zimovanju, jesenjoj i proljećnoj seobi.

Na Solilima je dosad zabilježeno 47 vrsta ptica vodenih staništa, od čega su 4 vrste stalno prisutne, oko 35 njih zimuju dok 6 vrsta vjerovatno gnijezde. Sa ostalim grupama ptica, pjevačicama, grabljivicama i dr., na Solilima je do sada registrovano 111 vrsta. No, spisak nije ni približno konačan, jer se svake godine na njima registruje po nekoliko novih za to stanište.

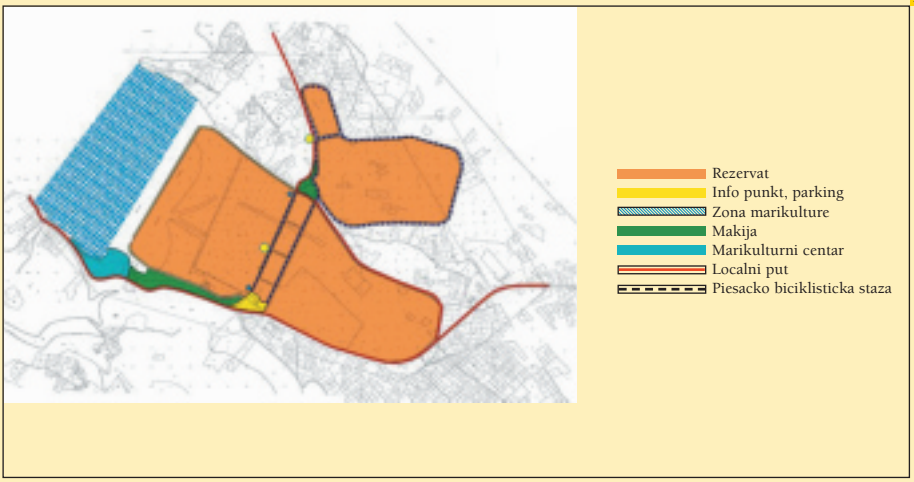
Obzirom da je u Evropi do sada registrovano 526 ptičjih vrsta, broj prisutnih ptica na ovoj laguni čini više od 20% ukupnog broja vrsta evropske ornitofane, što nije zanemarljivo. Posebno se ističe značaj najmanje 11 vrsta iz Aneksa I Ptičje direktive EU, te nekoliko globalno ugroženih ptičjih vrsta kakav je na primjer fendak, *Phalacrocorax pygmeus*.

MOST IMPORTANT FAUNA IN TERMS OF AMPHIBIANS, REPTILES AND BIRDS
NAJZNAČAJNIJI PREDSTAVNICI FAUNE VODOZEMACA, GMIZAVACA I PTICA

| | |
|---|---|
| Amphibians<br>Vodozemci | *Hyla arborea*<br>*Rana shqiperica*<br>*Triturus vulgaris* |
| Reptiles<br>Gmizavci | *Caretta caretta*<br>*Emys orbicularis*<br>*Ophisaurus apodus*<br>*Testudo hermanni*<br>*Vipera amodytes* |
| Birds<br>Ptice<br>(nesting)<br>(gnjezdarice) | *Alcedo attis*<br>*Actitis hypoleuctos*<br>*Cettia cetti*<br>*Charadrius alexandrinus*<br>*Rallus aquaticus* |
| (wintering)<br>(zimovalice) | *Anas penelope*<br>*Areda cinerea*<br>*Charadrius dubius*<br>*Egretta alba*<br>*Egretta garzetta*<br>*Fulica atra*<br>*Galinago galinago*<br>*Numenius arquata*<br>*Phalacrocorax pygmeus*<br>*Podiceps cristatus*<br>*Podiceps nigricollis*<br>*Tringa totanus* |
| (migrating)<br>(migranti) | *Anas querquedula*<br>*Limosa limosa*<br>*Vanelus vanelus* |

## SPECIAL FLORA AND FAUNA RESERVE

Because of the importance of the survival of flora (increasingly scarce along the 800-km long eastern shore of the Adriatic), and due to the fact that Tivat Salina is a habitat for numerous endangered species of amphibians, reptiles and birds, it was declared a special flora and fauna reserve in 2007. This reserve was the first of its kind on the Montenegrin coast and the first area on the coast to be protected after 1968, when many beaches were protected. Tivat Salina is an Emerald site under the Bern Convention and an important bird area in Montenegro.




## SPECIJALNI FLORISTIČKO FAUNISTIČKI REZERVAT

Zbog značaja za opstanak flore koja se rijetko gdje danas može naći na 800 km dugoj istočnoj obali Jadrana, kao i zbog činjenice da je stanište brojnim ugroženim vrstama vodozemaca, gmizavaca i ptica, Solila su 2007. godine zaštićena kao specijalni florističko faunistički rezervat, prvi takve vrste na crnogorskoj obali i prvo zaštićeno područje na obali poslije 1968. godine, kada je zaštićen veliki broj plaža. Solila su Emerald stanište Bernske konvencije i Područje od medunarođnog značaja za boravak ptica u Crnoj Gori - IBA.

## GLASSWORT - SOLNJAČA (*Salicornia*)

Glasswort, or *Salicornia*, is a succulent plant resistant to high salinity in the ground where it grows. In Montenegro, it has been registered only in Tivat Salina and Ulcinj Salina. When developing it is green, while in autumn it makes beautiful purple and red meadows, leaving nobody indifferent. It is of great importance for the ecology of Tivat Salina, because it is a nesting habitat for a large number of birds and a large number of other groups of animals.

It is also important for salt production due to the fact that perspiration is always greater by transpiration from plants than by evaporation. In many countries it is served with fish dishes and is used for making salads, which of course do not need salt. Its habitats are increasingly endangered by drainage and the conversion of saltpans into fish-farms or other purposes.

Solnjača pripada sukulentama otpornim na visoku zaslanjenost podloge na kojoj rastu. U Crnoj Gori se registruje samo na Tivatskim solilima i Ulcinjskoj solani. Tokom razvića ima zelenu boju da bi u jesen napravila prekrasne purpurno crvene livade, čija boja nikoga ne ostavlja ravnodušnim.

Posebno je važna u ekologiji solana jer je stanište za gniježđenje velikog broja ptica, te velikom broju ostalih grupa životinja. Značajna je i za proizvodnju soli jer je isparavanje uvijek veće transpiracijom iz biljaka nego prostom evaporacijom. U mnogim državama se služi uz jela od ribe kao i za pravljenje salata koje, naravno, ne treba soliti. Njena staništa su sve ugroženija isušivanjem, pretvaranjem solana u ribnjake ili za neku drugu namjenu.

## HERMANN'S TORTOISE - KORNJAČA (*Testudo hermanni*)

This turtle is one of five species of its order and inhabits Southern Europe. It is 20 cm long and weights up to 2 kg. Black, mosaic and ochre tiles cover its shell. It uses the morning sun to warm itself and eats plants selected by smell. Flowers are a favourite meal of Hermannn's Turtle and it will also eat fruit. Wintertime is spent in hibernation. which usually takes place in bedding. It lays its eggs in a hole in the ground facing the sun and lives a long life, averaging 70-100 years.

Jedna je od pet vrsta iz ovog roda. Naseljava Južnu Evropu. Dugačka je do 20 cm a teška do 2 kg. Ima mozaično rasporedene crno-oker pločice po oklopu. Jutarnje sunce koristi za zagrijavanje. Hrani se biljnom hranom koju odabira mirisom. Rado jede cvijeće, ponekad i voće. Jaja polaže u rupi u zemlji, obavezno na prisojnoj strani. Dugovječna je, živi u prosjeku od 70-100 godina. Hibernira tokom zime u stelji.

## PLOVER - ŽALAR SLJEPIĆ (*Charadrius alexandrinus*)

The length of its body does not exceed 17 cm. It is partially a migratory species in Montenegro and one of the most important nesting birds of Tivat Salina. It also breeds in Ulcinj Salina. It eats insects, molluscs and crustaceans from the mud. It is always near water and very skilled when flying. Once a year it breeds and lays 4 eggs. The nest is made of snail and mussel shells.

However, it sometimes just makes a hole in the sand or in the ground. It is easily distinguished from its two closest relatives, *C. hiaticula* and *C. dubius*, by a broken black necklace on its neck and by its darker legs. It is listed in Annex I of the Birds Directive as a species of special interest for protection.

Dužina njegovog tijela ne prelazi 17 cm. Kod nas je djelimična selica. To je jedna od najznačajnijih gnjezdarica Tivatskih solila. U Crnoj Gori gnijezdi još u Ulcinjskoj solani. Spada u živahne šljukarice koje se hrane insektima, mekušcima i račićima iz mulja. Uvijek je blizu vode. U letu je jako spretna. Gnijezdi jednom godišnje, polaže 4 jaja.

Gnijezdo pravi od ljuštura puževa i školjki, nekad samo udubi mjesto u zemlji ili pijesku. Od svoja dva srodnika *C. hiaticula* i *C. dubius* najlakše se razlikuje po prekinutoj crnoj ogrlici na vratu i tamnijim nogama. Nalazi se na Aneksu I Ptičje direktive kao vrsta od posebnog interesa za zaštitu.


Buljarica wetland

## GEOGRAPHICAL POSITION

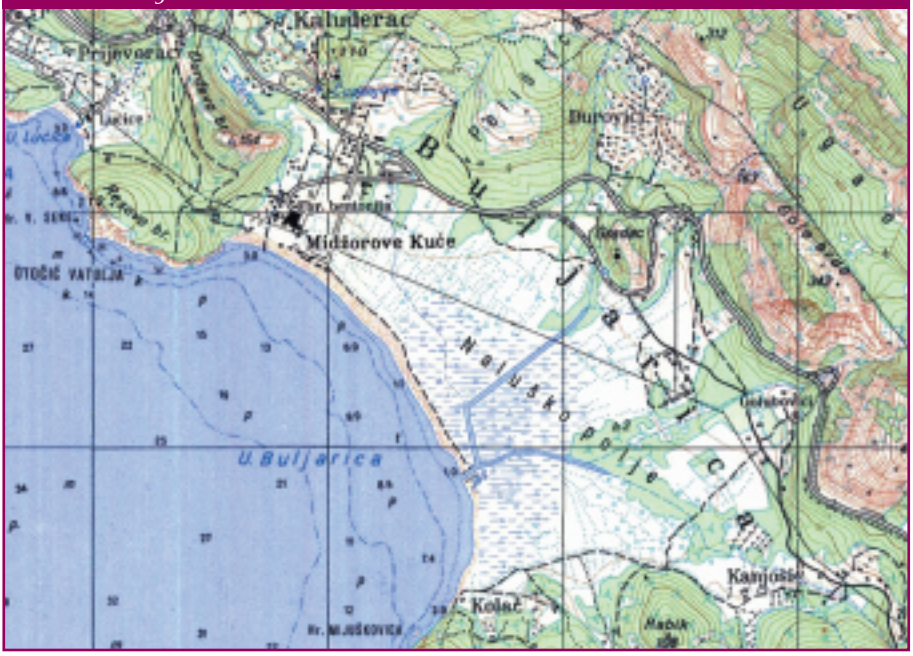
Buljarica is a sea ravine located between Petrovac on the northwest and Sutomore on southeast. In the hinterland is Pastrovacka Gora, dividing the bay from Lake Skadar, the largest fresh water basin in the Balkans. This is a rural area with underdeveloped infrastructure and virgin nature. It also has the longest beach on the Budva Riviera, 2,200m long, behind which lies a diluvial ravine. One of the very last, genuine ancient Mediterranean oak forests, containing *Quercus pubescens* and *Fraxinus oxycarpa*, is located there. There are several villages and campsites along the edge of the ravine. Cow and goat-breeding is the main occupation of villagers and thus they use the dry meadows for grazing. In winter the lakes of Buljarica are used for hunting, mainly birds.

### HOW TO ARRIVE

By car, one can reach Buljarica from four directions:
By road Bar - Budva, 25 kilometers from Bar
By road Podgorica - Buljarica, via Paštrovačka gora, 55 km
By road Podgorica - Budva, via tunnel Sozina, 53 km
By road Budva - Bar, 16 km

| BULJARICA | | | |
|---|---|---|---|
| | | Površina / Surface | 300 ha |
| E | 18°58'19.77" | Obala / Coast | 2.2 km |
| N | 42°11'26.62" | Dubina / Max depth | 1,40 m |

## POLOŽAJ




Buljarica predstavlja morsku uvalu koja se nalazi između Petrovca na sjeverozapadu i Sutomora na jugoistoku. U zaleđu se nalazi Paštrovačka gora koja odvaja ovaj zaliv od Skadarskog jezera, najvećeg slatkovodnog basena na Balkanu. Ovo je ruralno područje sa još uvijek nerazvijenom infrastrukturom i netaknutom prirodom. Buljarica je ujedno i najduža plaža na Budvanskoj rivijeri, duga oko 2200 m, iza koje se pruža poplavna uvala. U njoj se nalazi jedna od posljednjih izvornih, očuvanih i stoljetnih mediteranskih šuma hrasta *Quercus pubescens* i jasena *Fraxinus oxicarpa*. Po obodu uvale danas postoji nekoliko sela i zapuštenih kampova. Gajenje krava i koza glavno je zanimanje seljana koji nepoplavljene livade Buljarice koriste za ispašu stoke. Tokom zime jezera Buljarice se koriste za lov, uglavnom na ptice.

## KAKO DOĆI

Do Buljarice se dolazi iz četiri pravca autom:
Putem Bar - Budva, na 25 kilometata od Bara
Putem Podgorica - Buljarica, via Paštrovačka gora, 55 km
Putem Podgorica - Budva, via tunel Sozina, 53 km
Putem Budva - Bar, 16 km

## MORE INFORMATION - VIŠE INFORMACIJA

http://www.birdwatchingmn.org http://www.tob.cg.yu

http://www.morskodobro.com

# Nature protection

Buljarica beach has been protected since 1968 as an area with special natural characteristics. This status is given to only 4 ha of the beach as a habitat of xenomorphic and halophyte vegetation. In 1968, when protected area status was conferred, there was no sufficient data on other segments of flora and fauna. In early 2006, it obtained "Emerald" status under the Bern Convention as a unique, pristine habitat on the Adriatic coast, rich in biodiversity, wild flora and fauna.

In 2007 it was declared an Important Bird Area (300 ha), primarily as a breeding, wintering and resting place during the spring migration of birds coming from Africa via the Adriatic. Buljarica complies with three of the nine criteria of the Ramsar Convention as it is a unique, rare and representative wetland on the Eastern coast of the Adriatic and is a habitat for many endangered amphibians, reptiles and birds. It is also an important location for the migration of birds. Buljarica is one of the most attractive areas on the Montenegrin Adriatic coastline, and is thus economically insufficiently utilized. There is a real danger of transforming the whole ravine into a tourism complex and thus destroying all of its priceless natural assets.

## LANDSCAPE VALUE

Unlike anywhere else on the Montenegrin coast, due to its position Buljarica possesses unique landscape value. With Pastrovačka Gora in the hinterland, from which most of the Montenegrin coast is visible, and the rocks in the sea, it really represents "the wild beauty" of Montenegro.

The fact that it is in the heart of the coastal zone near Budva, which sees millions of overnights a year, but still possesses its virgin outlook, escapes nobody. However, it could provide an excellent model of smart development for the coast, with an ideal combination of tourism and nature protection.

## AIR, WATER, SOIL, NOISE

Together with Ulcinj Salina, Buljarica is one of the 7windiest locations on the Montenegrin coast, with a clear sky for a large number of days each year. On average, strong winds blow more than 110 days a year.

Stormy wind is less common, 30 days a year, while the number of cloudy days is the smallest on the Montenegrin coast, only 70 a year. Air and noise pollution are possible from the cars on the nearby main road connecting the towns along the coast.

# Zaštita prirode

Plaža Buljarica zaštićena je 1968. godine kao predio posebnih prirodnih odlika. Ovaj status dobija svega 4 ha plaže i to kao stanište kseromorfne i vegetacije zaslanjenih staništa. Tokom dobijanja statusa zaštićenog područja 1968. godine, nije bilo dovoljno podataka o drugim segmentima flore i faune. Početkom 2006. godine dobija status Emerald staništa Bernske konvencije kao jedinstvena, djevičanska i biodiverzitetom bogata uvala na obali Jadrana.

2007. godine je proglašena za područje od međunarodnog značaja za boravak ptica (300 ha), prvenstveno kao gnjezdilište, zimovalište i odmaralište na proljećnoj seobi ptica koje preko Jadrana dolaze iz Afrike.Buljarica zadovoljava i tri od devet kriterijuma Ramsarske konvencije kao jedinstvena, rijetka i reprezentativna močvara na Istočnoj obali Jadrana, stanište brojnih ugroženih vrsta vodozemaca, gmizavaca i ptica, te ključno mjesto u migraciji ptica. Buljarica je jedan od najatraktivnijih prostora na crnogorskom Jadranu, ekonomski nedovoljno iskorišćen. Realna je opasnost da se cijeli prostor ove uvale pretvori u turistički kompleks i time unište sve njene neprocjenjive prirodne vrijednosti.

## PANORAMSKE VRIJEDNOSTI

Na crnogorskoj obali se ne može naći uvala većih panoramskih vrijednosti od Buljarice. Sa Paštrovačkom gorom u pozadini, sa koje se vidi većina crnogorske obale, i hridima u moru, ona zaista predstavlja „divlju ljepotu“ Crne Gore.

Činjenica da se nalazi u srcu obalne zone nadomak Budve, koja godišnje ostvari milione noćenja turista i da je i dalje zadržala svoj djevičanski izgled, nikoga ne ostavlja ravnodušnim. Ona može biti najbolji primjer pametnog razvoja obale, idealno komponujući turizam sa zaštitom prirode.

## VAZDUH, VODA, ZEMLJIŠTE, BUKA

Uz Ulcinjsku solanu na jugoistoku, Buljarica predstavlja jedno od najprovjetrenijih priobalnih lokaliteta u Crnoj Gori, sa velikim brojem vedrih dana.

U prosjeku, jaki vjetar duva više od 110 dana godišnje, olujni je rjeđi, 30-tak dana, dok je tmurnih dana najmanje na Crnogorskom primorju, svega 70-tak. Zagađenje vazduha i buka mogući su od automobila sa obližnjeg magistralnog puta koji povezuje gradove na obali.

# Natural characteristics

*Ophrys sphegodes*

## FLORA AND VEGETATION

A band of *Phragmites australis* reedbeds stretches behind the beach, which is in some places wider than 30 m. Several lakes, constantly full of water, are located within this band. The reeds alternate with forests of ash (*Fraxinus oxycarpa*), oak (*Quercus pubescens*) and willow (*Salix sp.*) Forests and grasslands are divided by channels.

At higher altitudes, the wetland gives way to dry grasslands ending in settlements, above which there is rocky terrain with Mediterranean brush. The grasslands are neglected, without regular grass cutting. Many of them are covered with hornbeam (*Carpinus orientalis*), Jerusalem Thorn (*Paliurus spina cr.*) and Spanish Broom (*Sparcium junceum*) and other Mediterranean vegetation.

# Prirodne karakteristike

*Orchis papilionacea*

## FLORA I VEGETACIJA

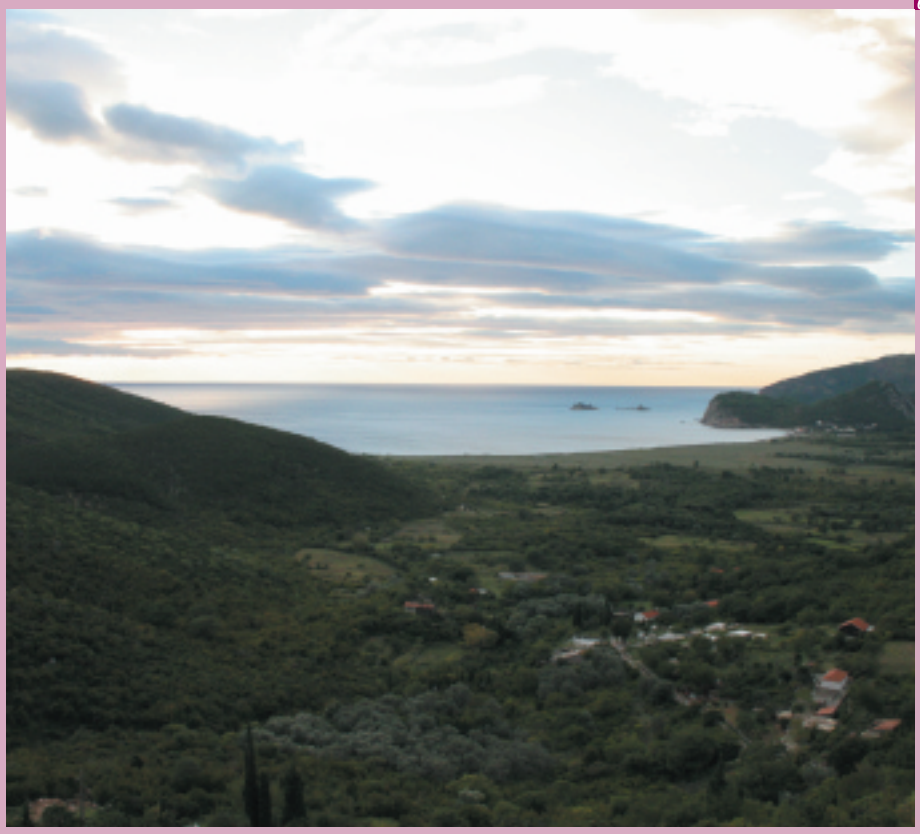
Iza šljunkovite plaže, koja je na nekim mjestima šira od 30 m, pruža se pojas trske *Phragmites australis* u okviru kojeg se nalaze jezerca stalno puna vodom. Trsku smjenjuje pojas vlažnih šuma jasena *Fraxinus oxicarpa*, duba *Quercus pubescens* i vrba, *Salix sp.*. Šume i pašnjaci su ispresijecani kanalima.

Na većoj visini, močvara iz vlažnih prelazi u suve pašnjake koji se završavaju naseljima, iznad kojih se nalazi kameniti teren sa mediteranskom makijom. Pašnjaci su zapušteni i ne kose se redovno. Mnogi su po obodu obrasli grabovima *Carpinus orientalis*, dračom *Paliurus spina* cr. te *Sparcium junceum* i drugom mediteranskom vegetacijom.

*Belis perenis*

*Equisetum arvense*

*Euphorbia wulfeni*



| Habitats - Staništa | Palearctic Habitat Classification<br>Palearktička klasifikacija staništa |
|---|---|
| *Mediterranean and thermo Altanthic salt meadows* | 15.5 |
| *Dunes* | 16.2 |
| *Riparian willow formations* | 41.1 |
| *Mediterranean oak woods* | 41.7 |
| *Mixed thermophilous forest* | 41.8 |
| *Southerm alder and birch galleries* | 44.5 |

*Rana temporaria*

## AMPHIBIANS AND REPTILES

The Common Tree Frog (*Hyla arborea*), the Common Frog (*Rana temporaria*), Hermann's Tortoise (*Testudo hermanni*), the European Pond Turtle (*Emys orbicularis*), and the Grass Snake (*Natrix natrix*) are only some of the creatures that await the curious eyes of tourists.

The untouched nature of Buljarica, its open meadows, preserved diluvial forest, streams and reedbeds are habitats for these animals. In slow-flowing channels there are important populations of Smooth Newt (*Triturus vulgaris*). There is probably, no larger number of such animals on the Eastern coast of the Adriatic, even in cleaner waters.

Gatalinka, *Hyla arborea*; livadska žaba, *Rana temporaria*; kornjača, *Testudo hermanni*; vodena kornjača, *Emys orbicularis*; prugasata bjelouška, *Natrix natrix*; samo su dio onoga što čeka radoznale oči turista.

Netaknuta priroda Buljarice, otvorene livade, očuvana poplavna šuma, kanali i trščaci koji su pod vodom idealna su staništa za ove grupe životinja. U kanalima gdje voda nije brza ima značajnih populacija mrmoljka, *Triturus vulgaris*. Vjerovatno ih na istočnoj obali Jadrana nema u većem broju i u čistijoj vodi.

EUROPEAN TREE FROG - GATALINKA (*Hyla arborea)*

One of the smallest European frogs, up to 5 cm long. Its colour depends on temperature and humidity, and thus varies from yellow to ochre, green and olive. It lays 10-50 eggs in wetland vegetation from the end of March till May. It lives on branches or reeds. Its skin stretches on the top of its fingers allowing it to stick even to the back of leaves.

Jedna od najmanjih evropskih žaba, dužine do 5 cm. Boja joj zavisi od temperature i vlažnosti i može je mijenjati od žute, oker, preko zelene do maslinaste. Polaže 10-50 jaja u močvarnoj vegetaciji od kraja marta do maja mjeseca. Uvijek je na granama ili trsci. Kožna proširenja na vrhovima prstiju omogućavaju joj da se lijepi i na naličja listova.

## EUROPEAN POND TURTLE - BARSKA KORNJAČA (*Emys orbicularis*)

Widespread in Southern and Central Europe. The shell is dark with bright spots. During the day it likes to sunbathe out of water. A good swimmer and diver, unlike turtles it is faster and more skilled on the ground. It eats fish, frogs, tritons and other water animals. It breeds in May, laying eggs in the ground which usually do not hatch until the following year. It is on the IUCN Red List as a vulnerable species. In the Balkans it is the target of collectors.

Raširena je u Južnoj i Centralnoj Evropi. Oklop je tamne boje sa svijetlim pjegama. Tokom dana se rado sunča van vode. Dobro pliva, roni i za razliku od kornjače, brža je i spretnija na kopnu. Hrani se ribama, žabama, mrmoljcima i ostalim vodenim životinjama. Pari se u maju. Jaja polaže u zemlji, ali se ona obično pile tek naredne godine. Nalazi se na Crvenoj listi IUCN kao ranjiva vrsta. Na Balkanu plaća danak sakupljačima akvaristima.

*Emberiza melanocephala*

*Merops apiaster*

## BIRDS

Buljarica is one of the largest and best preserved ecological complexes on the Adriatic coast. Wetlands with brackish water are ideal habitats for insects, amphibians and reptiles as well as vegetation, which make up the food base for birds. In winter, when a large part of the ravine is under water, Buljarica is the habitat for feeding and resting populations of the Pygmy Cormorant (*Phalacrocorax pygmeus*), the Grey, Great White and Little Heron (*Ardea cinerea, Egretta alba, Egretta garzetta*), and other aquatic birds. In summer it is a nesting place for the Levant Sparrowhawk (*Accipiter brevipes*), and in the vicinity on the sea rocks, the Sea Falcon (*Falco eleonorae*) also breeds.

The Reed Warbler (*Acrocephalus arundinaceus*) and Kingfisher (*Alcedo atthis*) breed in the marshes and wetlands while the Middle Spotted Woodpecker (*Dendrocopos medius*) and its relative the Syrian Woodpecker (*Dendrocopos syriacus*) nest in diluvial forests. The Rock Nuthatch (*Sitta neumayer*) and the Mediterranean Tit (*Parus lugubris*) breed in the surroundings. Buljarica is an important point on the migratory corridor, which is confirmed by the strong hunting pressure during winter. Several species of ducks and waders use it to rest during migration. The types of duck that migrate this way are the Wigeon (*Anas Penelope*), Pintail (*Anas acuta*), Teal (*Anas crecca*) and Garganey (*Anas querquedula*). Waders using this corridor include the Curlew Sandpiper (*Calidris feruginea*), Whimbrel (*Numenius phaeopus*) and others.

## PTICE

Buljarica je jedno od najprostranijih očuvanih ekoloških kompleksa na jadranskoj obali. Močvare sa bočatnom vodom idealna su staništa insekata, vodozemaca i gmizavaca, te vegetacije koja čini prehrambenu bazu za ptice. Tokom zimskih mjeseci, kada je dobar dio uvale pod vodom, Buljarica je stanište za ishranu i odmor fendaka, *Phalacrocorax pygmeus*, sive, velike i male bijele čaplje, *Ardea cinerea*, *Egretta alba*, *Egretta garzetta*, te ostalih vrsta ptica vezanih za vodu. U ljetnjim mjesecima ona je gnjezdilište kratkoprstog kobca Accipiter brevipes a nadomak nje, na morskim hridima i morskog sokola *Falco eleonorae*.

U tršćacima i močvarama gnijezdi trstenjak, *Acrocephalus arundinaceus*, vodomar, *Alcedo atthis*, a u poplavnim šumama srednji djetlić, *Dendrocopus medius* i njegov srodnik *Dendrocopos syriacus*. U okolini gnijezdi brgljez lončar, Sitta neumayer i mediteranska sjenica, *Sitta neumayer*. Buljarica je značajna tačka na seobenom koridoru, što potvrđuje i ekstremno jak lovni pritisak tokom zime: više vrsta plovki i šljukarica je koriste za odmor tokom seobe, u prvom redu patke: zviždarka, *Anas Penelope*; šiljkan, *Anas acuta*; krdža, *Anas crecca*; martovka ili mala patka, *Anas querquedula*, te šljukarice: crvenogrla sprutka, *Calidris feruginea*; srednja carska šljuka, *Numenius phaeopus* i druge.

## PENDULINE TIT - REMIZ (*Remiz pendulinus*)

The Penduline tit is connected to freshwater or brackish water. It is characterised by a grey head with a black line around the eyes. The nests hang above the water with 6 to 8 white eggs. The male makes several nests while the female selects one for laying the eggs. It eats insect and spider larvae and seeds in the winter. It is always lively and quite noisy

Sjenica vezana za slatku ili brakičnu vodu. Siva glava sa crnom linijom oko očiju. Gnijezda su viseća iznad vode sa 6 do 8 bijelih jaja. Spareni mužjak napravi više gnijezda i ženka odabira jedno za polaganje jaja. Hrani se larvama insekata i paucima, zimi sjemenjem. Uvijek živahna i jako bučna.

MOORHEN - BARSKA KOKICA (*Gallinula chloropus*)

The Box Moorhen is a small bird of green and black feathers with a bright red and yellow beak. These birds are numerous in Montenegro and are found on many water bodies that have dense vegetation on the shore. It nests in reeds or in shrubs, having two to three nests with 5 to 11 eggs. It is omnivorous, eating food found on the water surface or on the ground. Around twenty pairs breed in Buljarica.

Mala ptica zeleno-crnog perja, sa jarko crvenom i žutom bojom na kljunu. U Crnoj Gori brojna gnjezdarica na mnogim vodenim površinama sa gustom vegetacijom na obalama. Gnijezdi u trsci ili u žbunju, dva do tri legla sa 5 do 11 jaja. Svaštojed je ali se pretežno hrani beskičmenjacima, hranu uzima na površini vode ili na kopnu. U Buljarici gnijezdi dvadesetak parova.

COOT - BALJOŠKA (*Fulica atra*)

This black-grey aquatic bird with a white shield on the forehead is a nesting bird that is very common in Montenegro, particularly Lake Skadar. This species is especially numerous when wintering. It creates one or two nests on floating water vegetation. Each bird usually lays 5-15 eggs. Plants are the main food for these birds and they rarely eat small water animals. They can also dive for their food. It is a favourite hunting species and has almost been eradicated from nesting in Buljarica. Today, only a few couples breed their infants on the lakes of Buljarica.

Okruglasta vodena kokica crno-sive boje, sa bijelom lisom na čelu. U Crnoj Gori brojna gnjezdarica, posebno na Skadarskom jezeru. Posebno brojna na zimovanju. Plutajuća gnijezda gradi na vodenom rastinju, jedno do dva legla sa 5-15 jaja. Hrani se uglavnom biljem, manje malim vodenim životinjama, može da roni. Omiljena je lovna vrsta i skoro istrijebljena sa gniježđenja u Buljarici. Danas svoje mlade na jezercima Buljarice podiže svega nekoliko parova ove ptice.

GREY HERON - SIVA ČAPLJA (*Ardea cinerea*)

The Grey Heron is a big, elegant grey bird. It populates wetland and cultivated areas with water in the vicinity. It nests in colonies on trees, rarely in reeds. It has one nest with 4-6 eggs. A typical meal for this species includes various small animals found in the water and surrounding area. These nesting birds are not numerous in Montenegro but are common on all coastal marshes in winter, including Buljarica.

Velika, elegantna ptica sivo tamnih boja. Naseljava močvarne i kultivisane predjele sa vodom u blizini. Gnijezdi se u kolonijama na drveću, rijetko u trsci. Ima jedno leglo sa 4-6 jaja. Hrani se malim životinjama u vodi i oko nje. U Crnoj Gori nije posebno brojna gnjezdarica ali je česta na svim priobalnim vlažnim staništima tokom zime, pa i na Buljarici.

## MOST IMPORTANT FAUNA IN TERMS OF AMPHIBIANS, REPTILES AND BIRDS
## NAJZNAČAJNIJI PREDSTAVNICI FAUNE VODOZEMACA, GMIZAVACA I PTICA

| | |
|---|---|
| Amphibians | *Hyla arborea* |
| Vodozemci | *Triturus vulgaris* |
| Reptiles | *Emys orbicularis* |
| Gmizavci | *Ophisaurus apodus* |
| | *Testudo hermanni* |
| | *Vipera amodytes* |
| Birds | *Accipiter brevipes* |
| Ptice | *Acrocephalus arundinaceus* |
| (breeding) | *Dendrocopus syriacus* |
| (gnjezdarice) | *Galinula chloropus* |
| | *Parus lugubris* |
| | *Rallus aquaticus* |
| (wintering) | *Anas penelope* |
| (zimovalice) | *Areda cinerea* |
| | *Egretta alba* |
| | *Egretta garzetta* |
| | *Phalacrocorax pygmeus* |
| (migrating) | *Anas querquedula* |
| (migranti) | *Limosa limosa* |
| | *Numenius phaeopus* |

## INSECTS - INSEKTI

*Libellula depresa*

## DRAGONFLIES - VILINI KONJICI (*Odonata*)

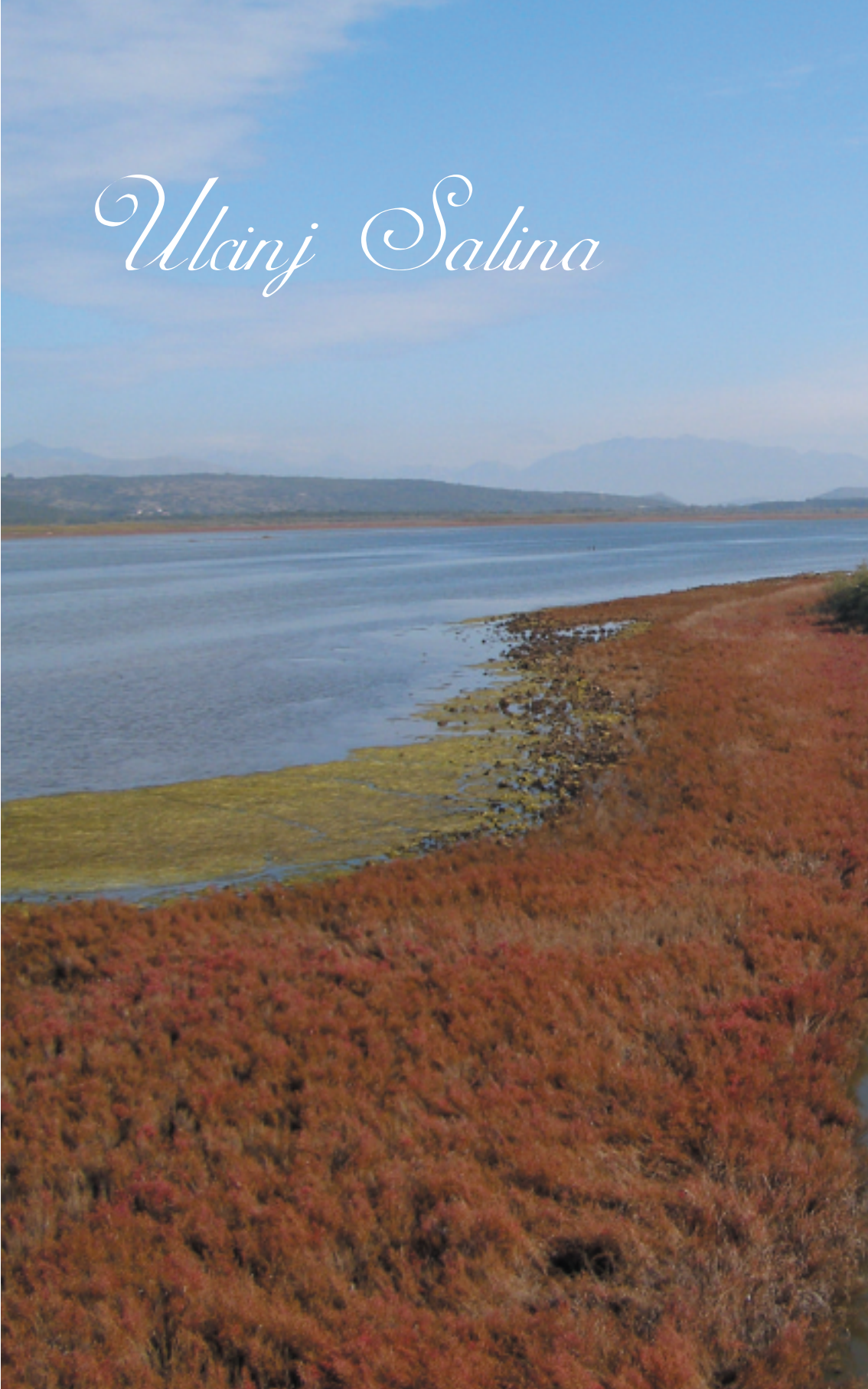
Because of the importance of the survival of flora (increasingly scarce along the 800-km long eastern shore of the Adriatic), and due to the fact that Tivat Salina is a habitat for numerous endangered species of amphibians, reptiles and birds, it was declared a special flora and fauna reserve in 2007. This reserve was the first of its kind on the Montenegrin coast and the first area on the coast to be protected after 1968, when many beaches were protected. Tivat Salina is an Emerald site under the Bern Convention and an important bird area in Montenegro.

Razvojni ciklus ove grupe insekata vezan je za vodena staništa. U vodi polažu jaja i imaju metamorfoze do stadijuma adulta, kada napuštaju vodenu sredinu i svojim bojama i letom postaju pravi ukras prirode. Pored značaja u lancima ishrane, ovi predatori u dobroj mjeri regulišu brojno stanje ostalih grupa insekata kojima se hrane. Na području Crne Gore registrovano je 62 vrste vilinih konjica. Na Buljarici, Tivatskim solilima i Ulcinjskoj solani registrovana je 21 vrsta. Ograničavajući faktori za diverzitet vrsta ove grupe insekata na navedenim staništima čine slana i bočata voda, jake struje ili nepravilni vremenski ciklusi plavljenja površina.

*Aeshna afinis*

*Orthetrum canccelatum*

*Platicnemis pennipes*


Ulcinj Salina

# GEOGRAPHICAL POSITION

Ulcinj Salina is located in the southernmost part of Montenegro and covers approx. 14.5 km² of salty basins. It is built in the region with the largest number of clear sky days and the most sunshine on the Adriatic - 2,567 hours - and the largest number of tropical days in ex-Yugoslavia. Hence, this is an ideal place for a Salina, i.e., a saltpan, which in this case bases its salt production exclusively on evaporation. The Salina is 1 km from Ulcinj town and the same distance from the border with Albania. There used to be the Zogajsko blato, 'Zogaj mudflats' ("zog" meaning "bird" in Albanian) in the area of the present Salina, a wetland with brackish water, which began to be significantly influenced by anthropogenic infrastructural intervention in the late 1830s.

Today it is an artificial, human-managed system where the rhythm of filling and emptying the basins with sea water, the water level and salinity are all predetermined. Hydro-regulation of the Zogaj mudflats began in 1913, when the Port Milena drainage channel was dug. The oldest saltpans were built in the period 1926-1934. Until the middle of the 20th century, the Salina was gradually upgraded. At the beginning of the 1980s it was extended by 60 percent and today covers approx. 1,492 ha. Thus, the Ulcinj Salina was created from the sea and represents a "cultural lagoon". The saltpan basins are surrounded by channels that drain the nearby swamps and depressions, taking the water into the Port Milena channel and thereafter into the sea.

The saltpans are separated from the sea by the Brijeg od mora and Velika plaža beach, and from the Bojana river by channels and dikes against floods. They are an important part of the Lake Skadar and Bojana River watershed system. The area covers 1,000 km². The area of the saltpans under shallow salt water is 1,383 ha (92.2%). Dikes, dividers and channels take up 109 ha (7.8%). The Ulcinj Salina is among the most important bird areas on the Adriatic. These important areas include: Velika plaža, Ada Bojana, the Šasko and Skadar Lake and Velipoja in Albania. The Ulcinj Salina is one of the largest and newest saltpans in the Mediterranean.

# POLOžAJ

Ulcinjska solana se nalazi na krajnjem jugu Crne Gore i zauzima oko 14.5 km² slanih bazena. Izgradeña je u regionu sa najvećim brojem vedrih dana, najvećom insolacijom na Jadranu - 2567 sunčanih sati i najvećim brojem tropskih dana u bivšoj Jugoslaviji. Dakle, idealno mjesto za solanu koja je proizvodnju soli zasnovala isključivo na evaporaciji. Solana je 1 km vazdušne linije udaljena od grada Ulcinja i isto toliko od granice sa Albanijom. Nekada je na prostoru današnje solane bilo Zogajsko blato ("zog" na albanskom znači "ptica"), močvara sa bočatnom vodom, koja je počela da poprima antropogeni infrastrukturni oblik krajem tridesetih godina pretprošlog vijeka.

Danas je ona vještački, od strane čovjeka dirigovani ekosistem, gdje je unaprijed određen termin punjenja bazena morskom vodom, nivo vode u njima i njen salinitet. Početak hidroregulacije Zogajskog blata vezan je za 1913. godinu, kada je iskopan drenažni kanal Port Milena. Najstariji solanski bazeni su građeni od 1926-1934. godine. Do polovine 20. vijeka Solana je postepeno dograđivana, ali je na površini dobila početkom 80 -tih kada je pročirena za 60 odsto ukupne teritorije, te danas ima 1,492 ha. Solana je, dakle, uzeta od mora i predstavlja "kulturnu lagunu". Ona je okružena kanalom koji drenira okolne močvare/knete, ne dozvoljavajući da se njihova voda miješa sa solanskom. Kanali odvode vodu u kanal Port Milena, a zatim u more.

Solana je od Jadrana odvojena Brijegom od mora i Velikom plažom a od Bojane kanalom i nasipima protiv poplava. Ona je važan dio sistema sliva Skadarskog jezera i rijeke Bojane, slivnog područja koje zahvata 1,000 km². Površina u Solani pod plitkom slanom vodom iznosi 1,383 ha (92.2%), nasipi, pregrade i kanali zauzimaju 109 ha (7.8%). Solana je u "sendviču" najznačajnijih ornitoloških lokaliteta na Jadranu, pa i šire: to su područja od međunarodnog značaja za boravak ptica Velika plaža, Ada Bojana, Šasko i Skadarsko jezero te Velipoja u Albaniji. Ulcinjska solana je jedna od deset najvećih i jedna od najmlađih solana na Mediteranu.


## HOW TO ARRIVE

By car:
from Podgorica 85 km
from Budva 68 km
from Skadar (Albania) via Sukobin 40 km

### Ulcinj salina - Ulcinjska solana

| | | | |
|---|---|---|---|
| E | 19°18'5,71" | Površina / Area | 1492 ha |
| N | 41°55'25,14" | Dubina / Max depth | 0,80 m |

KAKO DOĆI

AUTOM:
iz pravca Podgorice 85 km
iz pravca Budve 68 km
iz pravca Skadra (Albanija) via Sukobin 40 km

MORE INFORMATION - VIŠE INFORMACIJA

http://www.birdwatchingmn.org

# History of ornithology

The earliest ornithological records, from the end of the 19th century, show that this part of the Balkan Peninsula has long been of interest to ornithologists. The founder of Montenegrin ornithology, Ludwig von Fürer, spent three months in 1893 in the area of Ulcinj and recorded 39 nesting pairs of pelicans. He describes the Zogaj mudflats and their exceptional ornithological assets and does not forget to mention the hospitality of the local people. Ever since then, Ulcinj has "hosted" a number of ornithologists. Some of them left rich documentation on birds, and 250 species have been registered.

Because of their direct vicinity to the sea, the Bojana River, Lake Šasko, Velipoja in Albania and Lake Skadar, are interesting for ornithology and science in general. As it was created by the conversion of a swamp, the birds did not have to change their coordinates while migrating. The Ulcinj Salina has been on their route for a long time now. It has only changed its form and function.

## WHY IN ULCINJ?

In the early 20th century, the Government of the Kingdom of Yugoslavia ordered the exploration of the territory with the aim of finding the optimal location for construction of a saltpan. Assessments from Ankaran (in today's Slovenia) to Ulcinj were performed by *Guido Grisogono* and *Ante Koludrović*. After six years of work, they selected the Zogaj mudflats, the place where the present Ulcinj Salina is located. The territory of the Zogaj mudflats swamp was significantly reduced, and today only fragments remain.

# Istorija ornitologije

Da je ovaj dio Balkanskog poluostrva bio interesantan za ornitologe, pokazuju i prve ornitološke zabilješke s kraja 19. vijeka. Utemeljivač crnogorske ornitologije Ludwig von Fürer 1893. godine boravio je tri mjeseca na području Ulcinja i između ostalog, zabilježio 39 gnjezdećih parova pelikana. On opisuje močvaru Zogajsko blato i njeno veliko ornitološko bogatstvo, a ne zaboravlja da piše i o gostoprimnosti lokalnih ljudi. Od tada do današnjih dana, Ulcinj je "ugostio" veliki broj ornitologa, od kojih su neki ostavili bogatu građu o pticama, gdje ih je je registrovano oko 250 vrsta.

Neposredna blizina mora, Bojane, Šaskog jezera, Velipoje u Albaniji, pa i Skadarskog jezera, čine ovu "kulturnu lagunu"interesantnom za ornitologiju i nauku uopšte. Kako je nastala kultivisanjem močvare, ptice nijesu morale da mijenjaju svoje koordinate tokom selidbe. Ona na njihovom putu odavno postoji, samo je mijenjala oblik i funkciju.

## ZAŠTO BAš U ULCINJU?

Vlada Kraljevine Jugoslavije je početkom 20. vijeka naložila istraživanja sa ciljem pronalaska najoptimalnijeg mjesta za izgradnju solane na njenoj teritoriji. Istraživanja od Ankarana (danas Slovenija) do Ulcinja proveli su *Guido Grisogono* i *Ante Koludrović*. Nakon šest godina rada, odlučili su se za Zogajsko blato, mjesto na kojem se danas nalazi Ulcinjska solana. Izgradnjom solane, površina močvare Zogajsko blato znatno je umanjena i danas se nalazi samo u malim fragmentima.

## SALT PRODUCTION

The Ulcinj Salina is filled with sea water. At the beginning of April, strong pumps (3,000 l/sec) start drawing water and sea organisms in all their development stages. The water is pumped into shallow basins with an average depth of 20-30 cm. The water, which still has the same salinity as sea water, is transferred from basin to basin mainly by gravitation. From its entry to the saltpans until crystallisation, the water travels several dozen kilometres, and under the influence of the sun and strong winds it evaporates. From the initial 3.8 g/l of salt, it reaches 235 g/l of salt at the end of production (i.e. in the crystallisation basins).

After this, the salt production basins remain dry and are prepared for the next season. One third of the Salina is always under water. Those basins are not included in the production process, which thus enables the proliferation of life in the waters of this lagoon. The saltpan has a production capacity of 30,000 tones of salt annually. Salt is made of plain sea water, sun and wind. It is collected manually and is of high quality. The Ulcinj Salina is the best example of the synergy of economic production and nature protection in ecological Montenegro.

## MEDICINAL MUD, SALT AND TOURISM

The anaerobic conditions of the mud in the Ulcinj Salina basins has created large stocks of medicinal mud. Preliminary assessments have shown its high quality, primarily for the healing of arthritis and skin diseases. Together with sea salt, produced by wind and sun from the pure sea water and unpolluted air that blows in summer from the sea and in winter from unpopulated and clean mountains, it makes Ulcinj Salina a heaven for the development of eco- and medicinal tourism. Tourists are welcomed at the Info Centre of the Salina Museum at the entrance to Ulcinj Salina. There are viewpoints, towers and paths 3.9 and 17.6 km long, from which numerous bird flocks can be seen. It is the best example of connecting economic production and nature protection in Montenegro and an excellent opportunity for nature watching in vivo.

## PROIZVODNJA SOLI

Solana se puni vodom iz mora. Jake pumpe (3000 l/sec) početkom aprila počinju iz mora izvlačiti vodu i morske organizme u svim njihovim stadijumima razvića. Voda se preliva po plitkim bazenima prosječne dubine 20-30 cm. Voda koja je po salinitetu ravna morskoj, prevodi se iz bazena u bazen uglavnom gravitacijom. Od ulaza u Solanu do njene kristalizacije, pređe više desetina kilometara i pod uticajem jakog sunca i uvijek umjerenog do jakog vjetra isparava. Od početnih 3.8 g/l soli, na kraju proizvodnje tj. u kristalizacionim bazenima, voda dostigne koncentraciju iznad 235 g/l soli.

Nakon proizvodnje soli, bezeni ostanu suvi i pripremaju se za narednu godinu. 1/3 Solane je uvijek pod vodom i ti bazeni nijesu uključeni u proizvodni proces, čime se omogućava konstantno bujanje života u vodama ove lagune. Solana je projektovana za proizvodnju 30.000 tona soli godišnje. So je pravljena od čiste morske vode, sunca i vjetra. Sakuplja se ručno i visokog je kvaliteta. Solana je najbolji primjer spoja priveredne proizvodnje i zaštite prirode u ekološkoj Crnoj Gori.

## LJEKOVITO BLATO, SO I TURIZAM

Anaerobni uslovi u mulju solanskih bazena stvorili su velike zalihe ljekovitog blata. Preliminarna istraživanja ukazala su na njegov visoki kvalitet, u prvom redu za liječenje artiritisa i bolesti kože. Ako se to spoji sa morskom solju koju proizvode vjetar i sunce od čiste morske vode, te nezagađenim vazduhom koji ljeti duva sa mora a zimi sa nenaseljenih i čistih planina, Solana je uistinu raj za razvoj eko i zdravstvenog turizma. Turiste na ulazu u Solanu čeka Info centar sa Muzejom solane, osmatračnice, kule i staze od 3.9 i 17.6 km sa kojih puca odličan pogled na brojna jata ptica. Ona je najbolji primjer povezivanja privredne proizvodnje i zaštite prirode u Crnoj Gori i odlična prilika posmatranja prirode in vivo.

# Nature protection

The first law for the protection of Ulcinj Salina was enacted in 1984, when all hunting was banned by a decision of the Workers Council. Several years later, Ulcinj Salina became the first Important Bird Area (IBA) in Montenegro and afterwards became an Emerald site under the Bern Convention. Ulcinj Salina will soon be listed on the Ramsar List of Wetlands of International Importance, primarily as a bird site. It is the first private nature park in Montenegro.


## NATURAL CHARACTERISTIC - FLORA AND VEGETATION

The vegetation around Ulcinj Salina does not vary significantly from the vegetation described in the chapter on Tivat Salina, but the habitats are much larger. Currently, 114 plant species have been described. Besides open fields of halophytes (60 ha), there are more than 8 ha of *Phragmites* reedbeds. *Tamarisks* and other woody species cover 13 ha of dikes. One basin in Ulcinj Salina is not active and represents a real museum of halophyte and wetland vegetation.

The dikes are no less interesting: meadows of orchids in the spring, mostly *Ophrys bertolonii* and *Orchis laxiflora*, give way to xenomorphic vegetation during the hot summer days. Halophyte communities are very interesting due to their acclimatisation to rather severe physiological conditions of brackish soil and water. *Salicornia*

# Zaštita prirode

Prvi akt o zaštiti Solane donešen je 1984. godine, kada se odlukom Radničkog savjeta zabranjuje svaki lov. Nekoliko godina kasnije, Solana postaje prvo Područje od međunarodnog značaja za boravak ptica u Crnoj Gori, a zatim i Emerald stanište Bernske konvencije. Solana će se uskoro naći i na Ramsarskoj listi močvara od medunarodnog značaja, prvenstveno kao stanište ptica. Ona je prvi privatni park prirode u Crnoj Gori.

## PRIRODNE KARAKTERISTIKE - FLORA I VEGETACIJA

Sastav vegetacije na Solani ne razlikuje se bitno od one opisane u poglavlju za Tivatska solila, ali su staništa znatno prostranija. Do sada je na solanskim bazenima opisano 114 biljnih vrsta. Pored prostranih livada halofita (60 ha), na Solani se nalaze velika polja pod trskom *Phragmites*, više od 8 ha. *Tamariks* i ostale drvenaste vrste pokrivaju 13 ha nasipa. Jedan bazen solane nije aktivan i predstavlja pravi muzej halofita i močvarne vegetacije.

Ni nasipi nijesu ništa manje interesantni: livade orhideja tokom proljeća, najčešće *Ophrys bertolonii* i *Orchis laxiflora*, smjenjuje kseromorfna vegetacija tokom paklenih ljetnjih dana. Zajednice halofita solana su vrlo interesantne jer su prilagožene životu u veoma teškim fizioločkim uslovima zaslanjenosti podloge,

*herbacea* is the dominant species in the *Salicornietum herbaceae* association, together with *Sueda maritima*, *Limonium angustifolium* and *Atriplex portulacoides*. The presence of *Salsola soda* and *Atriplex prostrate* is also important. In addition, the *Arthrocnemetum fruticosi* association is also sometimes recorded.

Vegetation growing in the sludge of Ulcinj Salina is mostly present in channels where the water and ground salinity is much lower. This vegetation changes with the seasons, and starts with *Narcissus tarzetta* and *Romulea bulbocodium*. Later, these give way to *Avena barbata*, *Phragmites communis*, *Carex sp*., *Tripholium nigricens* and others. Reeds are present in channels and the group of basins where the salinity of the water is the same or twice as salty as the sea water.

They are rather aggressive and have expanded more and more over the years. *Tamarix africana*, *Juncus acutus* and *Juncus maritimus* grow adjacent to the reeds. *Beta vulgaris ssp. maritime* is a species which in Montenegro lives only in Ulcinj Salina. Ruderal vegetation is dominant on dikes as an indicator of human presence; grass cutting and continuous grazing.

| Habitats - Staništa | Palearctic Habitat Classification<br>Palearkti_ka klasifikacija staništa |
|---|---|
| *Mediterranean and thermo Altanthic salt meadows* | 15.5 |
| *Mediterranean salt steppes* | 15.8 |
| *Mediterranean xeric grasslands* | 34.53 |

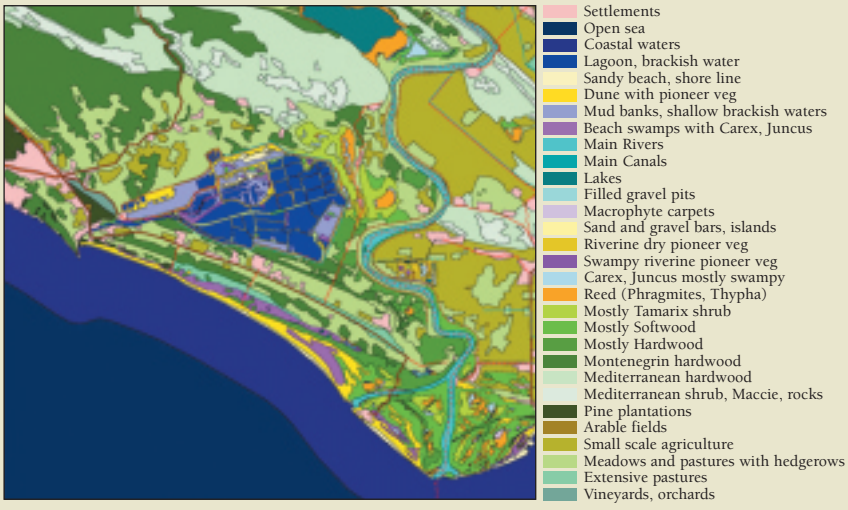
| Group / Grupa | Number of species / Broj vrsta |
|---|---|
| Fish / Ribe | 23 |
| Amphibians / Vodozemci | 12 |
| Reptiles / Gmizavci | 28 |
| Birds / Ptice | 241 |
| Mammals / Sisari | 33 |

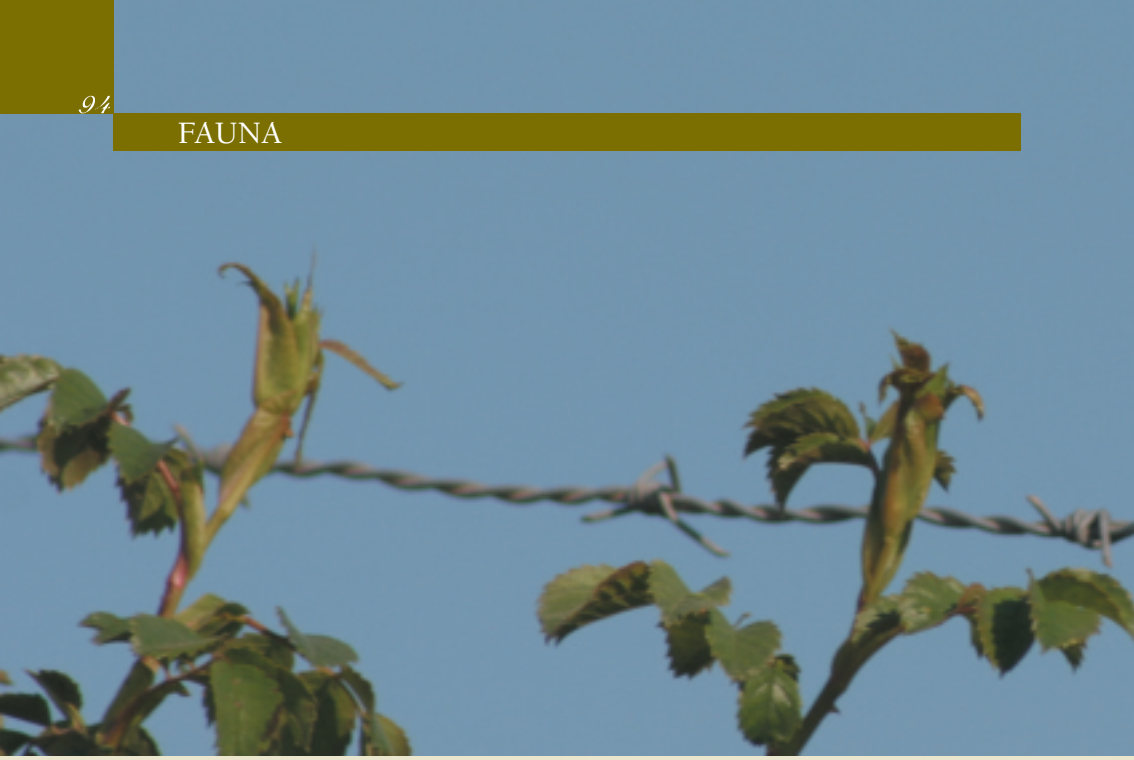
samim tim i vode. Solnjača, *Salicornia herbacea* je dominantna vrsta u zajednici *Salicornietum herbaceae* koju tvori sa *Sueda maritima*, *Limonium angustifolium* i *Atriplex portulacoides*. Značajno je i prisustvo Salsola soda i *Atriplex prostrata*. Uz ovu zajednicu, u jako zaslanjenoj zoni može se registrovati i zajednica *Arthrocnemetum fruticosi*.

Vegetacija koja raste na solanskom mulju najprisutnija je u kanalima solane gdje je salinitet vode i podloge znatno niži. Ova vegetacija se mijenja tokom godišnjih doba a počinje sa *Narcissus tarzetta* i *Romulea bulbocodium*. Kasnije ih smjenjuju *Avena barbata*, *Phragmites communis*, *Carex sp.*, *Tripholium nigricens* i dr.

Trska je prisutna u kanalima i skupini bazena gdje je voda ili jedanaka ili duplo slanija od morske. Prilično je agresivna i širi se iz godine u godinu sve više. Uz trsku rastu *Tamarix africana*, *Juncus acutus* i *Juncus maritimus*. *Beta vulgaris ssp. maritime* je vrsta koja u Crnoj Gori živi jedino na Ulcinjskoj solani. Na nasipima je dominantna ruderalna vegetacija kao indikator prisustva čovjeka, košenja trave i stalne ispaše.

HABITAT CLASSIFICATION





## AMPHIBIANS AND REPTILES

12 species of amphibians and 28 species of reptiles survive in the hot summer conditions of Ulcinj Salina. Amphibians barely survive in the salty or fresh water channels, where they are an easy catch for numerous birds. The surrounding brackish swamps are thus an ideal habitat for them. At the opposite extreme, reptiles have their empire in Ulcinj Salina: numerous birds make their nests and hatch their eggs along the dikes.

Along with numerous insects these make ideal food for the reptiles - unless they are eaten by birds themselves. It is possible to hide in the high grass and the numerous stone walls or cavities in the dikes. The largest number of species of both groups registered in the dikes of Ulcinj Salina are vulnerable, endangered or critically endangered species according to IUCN standards.

## BIRDS

If we were seeking the most exclusive habitat for birdwatching in the Adriatic, the Balkans or even the whole Mediterranean, Ulcinj Salina would definitely be at the top of the list. Currently 241 bird species have been registered in this “cultural lagoon”, which is 50% of the total bird species registered in Europe. In the wider region, there are habitats where the number of registered birds is even higher, but what makes Ulcinj Salina special is the quality of species and their number. The number of birds using the Ulcinj Salina basins for breeding, wintering or resting

*Carduelis carduelis*

## VODOZEMCI I GMIZAVCI

12 vrsta vodozemaca i 28 vrsta gmizavaca opstaju u paklenim ljetnjim uslovima na Solani. Vodozemci teško izdržavaju u slanoj vodi ili u slatkovodnim solanskim kanalima, gdje su lak plijen brojnim pticama. Zato su okolne brakične močvare za njih idealno stanište.

Za razliku od njih, gmizavci na Solani imaju svoje carstvo: veliki broj ptica, njihova jaja i ptići koji se pile na nasipima, te brojni insekti su njihova idealna hrana, ukoliko i same ne budu pojedene od ptica. Mogućnost za njihovo sakrivanje postoji u visokoj travi i brojnim podzidama ili rupama na nasipima. Najveći broj vrsta iz obje grupe a koje se registruju na solanskim nasipima su ranjive, ugrožene ili kritižno ugrožene prema standardima IUCN.

## PTICE

Ako bismo na prostorima Jadrana, Balkana pa i čitavog Mediterana tražili najekskluzivnije stanište za posmatranje ptica, onda bi Ulcinjska solana ušla u najjuži izbor. Do sada je na ovoj „kulturnoj laguni“ registrovano 241 vrsta ptica, što je oko 50% ukupnog broja vrsta ptica registrovanih u Evropi. U regionu pa i šire postoje staništa gdje je broj registrovanih vrsta znatno veći, ali ono što Solanu odvaja od svih ostalih je kvalitet vrsta i njihova brojnost. Brojno stanje gotovo 15 vrsta koje solanske bazene koriste za gniježđenje, zimovanje ili stanicu za odmor prilikom jesenje ili

during spring or autumn migration exceeds the threshold of 1% of the total global bird population. Amazingly, an area of 15 km² hosts 3% of the total global population of the Dalmatian Pelican (*Pelecanus crispus*), 3% of the global population of the Black Tailed Godwit (*Limosa limosa*), and the same percentage of the Spotted Redshank (*Tringa erythropus*)! 55 bird species breed in the Ulcinj Salina. Almost half of the registered breeding pairs of aquatic birds in the whole region breed here. 70 of the registered bird species in this area are of special protection interest on the level of the European Union and are included in Annex I of the Birds Directive.

Results of the IWC winter bird census, which has been performed since 1999 in Ulcinj Salina, shows the presence of 20,000 birds every year, regardless of whether the basins are empty or full of water. Outside the production season, the dikes are subject to erosion as a result of waves; therefore the water is pumped out . In some dry winters, this makes the birds concentrate on a few basins and the scenes are exceptional to behold.

However, the most beautiful season in Ulcinj Salina is spring: early migration brings large and dense flocks of ducks: the Garganey (*Anas querquedula*) comes in the largest numbers, up to 1200 birds per hour. It is very tired from the flight over the Adriatic and lands on this rich breading place to renew its energy before continuing its journey north. Its relative the Teal (*Anas crecca*) is also exhausted from the long flight. It joins the flocks of Pintail (*Anas acuta*) and Wigeon (*Anas penelope*) which have spent the winter in Ulcinj Salina and survived the bullets of local hunters.

Thousands of Waders also come, very tired. Their flocks are smaller but that does not reduce interest in their protection: most of them have unfavourable protection status and their number is declining faster than other groups of birds, primarily due to loss of habitat. Tens of thousands of swallows use Ulcinj Salina as a resting place on their trip back from Africa: the tamarisk trees are small for these lively birds and thus they land and rest on dikes. It sometimes happens that the whole dike becomes black from the Barn Swallow (*Hirundo rustica*) and House Martin (*Delichon urbica*). The Whinchat (*Saxicola rubetra*), Yellow Wagtail (*Motacila flava*), Flycatcher (*Muscicapa striata*) and Meadow Pipit (*Anthus pratensis*) come in flocks of 10,000 birds a day! In spring, Ulcinj Salina is a transitory station for more than 40,000 migrating birds a day.

Exceptional conditions in spring soon give way to the heat of summer. The struggle to raise the nestlings and later on, their preparations for migrating to warmer wintering places continue. The situation is highly dynamic. In autumn, the majority of our nesting birds are getting ready for the journey south, while tired birds from Siberia and Northern Europe will enjoy the Mediterranean winter, rainy but with few frosts, although they will also need to survive tempestuous cold winds from the surrounding mountains.

proljećne seobe prelazi prag od 1% ukupne svjetske populacije. Zamislite da se na 15 km$^2$ nalazi 3% ukupne svjetske populacije pelikana *Pelecanus crispus* ili 3% svjetske populacije muljače *Limosa limosa* ili isto toliki procenat crvenonoge sprutke *Tringa erythropus*!! Na Solani gnijezdi 55 vrsta ptica. Skoro polovina od ukupnog broja gnjezdećih parova vodenih ptica u cijelom regionu gnijezdi na Solani. 70 vrsta registrovanih na ovom području od posebnog je interesa za zaštitu na nivou Evropske Unije i nalazi se na Aneksu I Ptičje direktive.

Rezultati zimskog cenzusa ptica koji se na Solani provodi od 1999. godine ukazuju na prisustvo oko 20.000 ptica svake godine, bez obzira da li su bazeni ispunjeni vodom ili ne. Van sezone proizvodnje soli, voda nije poželjna u bazenima zbog erozije nasipa usljed djelovanja talasa i ona se ispumpava iz Solane. Pojedinih sušnih zima to koncentriše ptice na samo nekoliko bazena i prizori su izuzetni.

Ipak, najljepše je proljeće na Solani: rana seoba donosi velika i gusta jata pataka: martovka, *Anas querquedula* dolazi u najvećem broju, čak i do 1200 jedinki na sat. Slijeće umorna sa leta preko Jadrana da bi na ovom bogatom hranilištu obnovila energiju za dalji put ka sjeveru. Njena srodnica krdža, *Anas crecca*, takođe je iscrpljena od višesatnog leta. Pridružuje se jatima šiljkana *Anas acuta* i zviždarke *Anas penelope* koje su na Solani provele zimu i izbjegle olovna zrna lokalnih krivolovaca.

Na hiljade šljukarica takođe dolaze umorne. Njihova jata su manja ali to ne umanjuje interes za njihovu zaštitu: većina njih je sa nepovoljnim statusom zaštite i brojnost im opada brže nego drugim grupama ptica, prvenstveno zbog gubitka staništa. Na desetine hiljada lasta koriste Solanu kao odmorište tokom povratka iz Afrike: drveće tamariksa je malo za ove živahne ptice, pa one slijeću i odmaraju na nasipima. Desi se da se cijeli nasip zacrni od seoske *Hirundo rustica* i gradske laste *Delichon urbica*. Travarka, *Saxicola rubetra*, žuta pliska, *Motacila flava*, muharica *Muscicapa striata* i livadska trepteljka *Anthus pratensis* dolaze u jatima sa 10.000 jedinki dnevno!

Solana je tokom proljeća prolazna stanica za više od 40.000 selica dnevno. Izvanredne uslove tokom proljeća ubrzo zamjenjuju paklene vrućine ljeti, borba za podizanje mladunaca i, kasnije, njihove pripreme za odlazak na toplija zimovališta. Dinamika je prisutna svuda u zraku. S jeseni, većina se naših gnjezdarica sprema na put ka jugu a umorne ptice iz Sibira i sa sjevera Evrope uživače tokom zime u mediteranskoj kišnoj zimi sa malo mrazova, ali i preživljavati orkanske i hladne vjetrove sa okolnih planina.

## MOST IMPORTANT FAUNA IN TERMS OF AMPHIBIANS, REPTILES AND BIRDS
## NAJZNAČAJNIJI PREDSTAVNICI FAUNE VODOZEMACA, GMIZAVACA I PTICA

| | |
|---|---|
| Amphibians | *Bombina variegata* |
| Vodozemci | *Bufo viridis* |
| | *Rana temporaria* |
| Reptiles | *Algyroides nigropunctatus* |
| Gmizavci | *Elaphe longissima* |
| | *Elaphe quatuorelineata* |
| | *Elaphe situla* |
| | *Hemidactylus turcicus* |
| | *Lacerta oxycephala* |
| | *Lacerta trilineata* |
| | *Lacerta viridis* |
| | *Podarcis melisellensis* |
| | *Podarcis muralis* |
| | *Testudo hermanni* |
| | *Vipera amodytes* |
| Birds | *Acrocephalus scirpaceus* |
| Ptice | *Botaurus stellaris* |
| (breeding) | *Carduelis cannabina* |
| (gnjezdarice) | *Charadrius alexandrinus* |
| | *Charadrius dubius* |
| | *Galerida cristata* |
| | *Glareola pratincola* |
| | *Haematopus ostralegus* |
| | *Himantopus himantopus* |
| | *Hirundo daurica* |
| | *Larus cachinnans* |
| | *Larus genei* |
| | *Recurvirostra avosseta* |
| | *Sterna albifrons* |
| | *Sterna hirundo* |
| | *Tadorna tadorna* |
| | *Tringa totanus* |
| (wintering) | *Anas acuta* |
| (zimovalice) | *Anas penelope* |
| | *Ardea cinerea* |
| | *Calidris alpina* |
| | *Egretta alba* |
| | *Pelecanus crispus* |
| | *Phalacrocorax pygmeus* |

| | |
|---|---|
| (migrating) | *Anas querquedula* |
| (migranti) | *Limosa limosa* |
| | *Philomachus pugnax* |

*Glareola pratincola*

## RED LIST

Regarding the IUCN Red List of endangered species, Ulcinj Salina is a residence for one bird species - the Slender-billed Curlew (*Numenius tenuirostris*), which is critically endangered - CR C2a(ii); D; the endangered Skadar frog (*Rana shqiperica*) - EN B1ab(iii), and 3 vulnerable bird species: the Dalmatian Pelican (*Pelecanus crispus*) - VU A2ce+3ce; the Lesser White-fronted Goose (*Anser erythropus*) - VU A2bcd+3bcd; the Spotted Eagle (*Aquila clanga*) - VU C1.

MOST NUMEROUS BREEDING BIRDS IN ULCINJ SALINA IN 2005 - 2007
NAJBROJNIJE GNJEZDARICE ULCINJSKE SOLANE SA PROSJEČNIM BROJEM PAROVA 2005 - 2007

| | (average n° of pairs) |
|---|---|
| *Burchinus oedicnemus* | 4 - 16 |
| *Charadrius alexandrinus* | 30 - 50 |
| *Glareola pratincola* | 100 - 120 |
| *Himantopus himantopus* | 40 - 130 |
| *Sterna albifrons* | 80 - 150 |
| *Sterna hirundo* | 50 - 80 |

SPECIES IN ULCINJ SALINA WHICH, WHEN WINTERING, MIGRATING OR NESTING, EXCEED 1 % OF THE GLOBAL POPULATION / POJEDINE VRSTE NA ULCINJSKOJ SOLANI ČIJA BROJNOST NA ZIMOVANJU, SEOBI ILI GNIJEŽĐENJU PRELAZI 1% SVJETSKE POPULACIJE

| Species | WPE3 | WPE4 |
|---|---|---|
| *Calidris alpina* | 1% | 1% |
| *Charadrius alexandrinus* | 1% | 0,5% |
| *Egretta alba* | 1% | 1% |
| *Egretta garzetta* | 1,5% | 1% |
| *Glareola pratincola* | 1% | 1% |
| *Himantopus himantopus* | 1% | 1% |
| *Limosa limosa* | 3% | 3% |
| *Numenius tenuirostris* | 1% | 1% |
| *Pelecanus crispus* | 1% | 2% |
| *Phalacrocorax pygmeus* | 1% | 0,5% |
| *Platalea leucorodia* | 1% | 1% |
| *Pluvialis squatarola* | 1% | 1% |
| *Tadorna tadorna* | 1% | 1% |
| *Tringa erythropus* | 1,5% | 3% |
| *Ttringa stagnatilis* | 1,5% | 2% |

## CRVENA LISTA

U vezi sa IUCN Crvenom listom ugroženih vrsta, Solana Ulcinj je boravište jednoj vrsti ptice - maloj carskog šljuki koja je kritično ugrožena *Numenius tenuirostris* - CR C2a(ii); D; ugroženoj skadarskoj žabi žabi *Rana shqiperica* - EN B1ab(iii) i 3 ranjive vrste ptica *Pelecanus crispus* - VU A2ce+3ce ; *Anser erythropus* - VU A2bcd+3bcd ; *Aquila clanga* - VU C1

*Tadorna tadorna*

BLACK WINGED STILT - VLASTELICA (*Himantopus himantopus*)

The Black Winged Stilt is a bird that lives at very high altitudes. Saltpans and shallow wetlands are its habitats. In Montenegro, it nests only in Ulcinj Salina, with a hundred pairs every year. It has one nest with 2-3 eggs. The nest is cone-shaped and raised above the water surface. Careless water management of saltpan basins can cause flooding of the nests, eggs and nestlings. This bird eats insects found in sludge. It belongs to Annex I of the EU Birds Directive.

Ptica za koju se komotno može reći da živi na visokoj nozi. Njena su staništa solane i plitke močvare. U Crnoj Gori gnijezdi samo na Ulcinjskoj solani sa oko stotinak parova svake godine. Ima jedno leglo, 2-3 jaja. Gnijezdo je kupasto i uzdignuto iznad površine vode. Nesmotreno upravljanje vodom u bazenima solane može uzrokovati potapanje gnijezda, jaja i mladih. Hrani se insektima koje pronalazi u mulju. Nalazi se na Aneksu I Ptičje direktive EU.

DUNLIN - CRNOGRUDA SPRUTKA (*Calidris alpina*)

The Dunlin is grey in winter and in summer has a dark spot on its belly. This very lively bird runs on sludgy ground looking for food. It nests on the ground in the northern continents. It is frequent in Ulcinj Salina, where several thousand of them winter. It can even be found in summer.

Zimi siva, ljeti sa tamnom pjegom na trbuhu. Jako živahna, trči po muljevitoj podlozi tražeći hranu. Uvijek u jatima. Gnijezdi na tlu na sjeveru kontinenta. Na Ulcinjskoj solani, gdje zimuje nekoliko hiljada jedinki, česta i ljeti.

DALMATIAN PELICAN - PELIKAN (*Pelecanus crispus*)

The Dalmatian Pelican is one of the most famous and rarest birds in Montenegro. It can be recognized by its long beak and has a throat that serves as a bag for keeping fish. This endangered and rare nesting bird of Lake Skadar regularly resides in Ulcinj Salina after nesting and during winter. Ulcinj Salina is its most important residence in the whole region for resting, feeding and resting. Rings placed on this bird show that a hundred wintering pelicans come from Greece and Albania to Ulcinj Salina. It nests on islands of peat, reeds and other dead lake plants. It makes one nest with 1-3 eggs and likes to eat fish. The Dalmatian Pelican is a globally endangered species and belongs to Annex I of the EU Birds Directive.

Jedna od najpoznatijih i najrjeđih ptica u Crnoj Gori. Prepoznaje se po dugačkom kljunu sa gušom koja služi za držanje ribe. Ugrožena i malobrojna gnjezdarica Skadarskog jezera, poslije gniježđenja i tokom zime redovno se javlja na Ulcinjskoj solani. Solana je njihovo najznačajnije stanište za odmor, ishranu i skitnju u cijelom regionu. Očitavanje prstenova ukazuje da stotinak zimujućih pelikana na solani dolazi iz Grčke i Albanije. Gnijezdi se na ostrvcima treseta, trske i drugog mrtvog jezerskog bilja, jedno leglo sa 1-3 jaja. Hrani se ribom.Globalno ugrožena vrsta. Nalazi se na Aneksu I Ptičje direktive EU.

## COMMON TERN - čIGRA (*Sterna hirundo*)

This bird is the size of a pigeon. Its body and tail are white with grey and it has grey wings. In summer it has a black cap on its head and the tail is significantly forked. This bird breeds in Ulcinj Salina making one to two nests with 3 eggs. It breeds on the ground of slightly rising dikes. The nests are covered by the residues of snails and shells. It is a bird of passage, wintering around the South Pole. It eats small fish and insects as it dives from the air. The Common Tern is listed in Annex I of the EU Birds Directive.

Ptica veličine goluba. Tijelo i rep su bijeli, krila siva, ljeti na glavi crna kapica, rep upadljivo račvast. Gnjezdarica solane, jedno do dva legla sa 3 jajeta. Gnijezdi kolonijalno na blago uzdignutim nasipima a gnijezdo je pokriveno ostacima puževa i školjki. Selica je koja zimuje oko Južnog pola. Hrani se sitnom ribom i insektima, obrušavanjem iz vazduha. Nalazi se na Aneksu I Ptičje direktive EU.

## PYGMY CORMORANT - FENDAK (*Phalacrocorax pygmeus*)

This is the smallest cormorant, half the size of the Great Cormorant (*Phalacrocorax carbo*). It has a short neck and is dark in colour with light spots on its body. It nests in colonies on the shores of the Bojana River and Lake Skadar in bushes and trees along the water. When nesting it makes one nest with 3-7 eggs. It mainly eats small fish and occasionally eats crustaceans and molluscs. Ulcinj Salina is its most important feeding place on the Adriatic coast. It is a globally endangered species and is listed in Annex I of the EU Birds Directive

Naš najmanji kormoran, upola manji od vranca *P. carbo*. Kratkog vrata, tamne boje sa svijetlim sitnim pjegama po tijelu. Gnjezdarica obala rijeke Bojane i Skadarskog jezera. Gnijezdi se u kolonijama na grmlju i drveću uz vodu, jedno leglo sa 3-7 jaja. Hrani se uglavnom manjim ribama, rjeđe rakovima i mekušcima. Solana je njegovo najznačajnije hranilište na jadranskoj obali. Globalno ugrožena vrsta. Nalazi se na Aneksu I Ptičje direktive EU.

*Anguilla anguilla*

Ulcinj Salina is a closed system; thus, there is no way that fish from the surrounding channels can get into the basins. Their presence is possible only if they can cross the dikes between basins, which is only possible for eel, or if they come directly from the sea by pumping: the powerful pumps filling the basins with sea water usually pump in eggs, larvae, or the progeny of sea organisms. All longer organisms are chopped up by the pumps' propellers. This occurs in April, when the production process starts, with the pumping of hundreds of thousands of cubic metres of sea water. Animals brought in by the pumps develop in the basins till June, when the water rapidly starts heating and the oxygen in the water falls. Some species, such as eel, dig into the sludge and wait for the first favourable situation for further development, while others perish or remain on the surface of the water where they become an easy catch for thousands of birds. Depending on the water salinity in some basins, 23 fish species have been recorded so far.

In basins where the salinity is the same as the sea water, which cover a large part of the saltpans, the following economically important fish species are recorded: various species of mullet (*Mugilidae: Liza ramada, Liza saliens, Liza aurata, Chelon labrosus, Mugil cephalus*), eel (*Anguillidae: Anguilla anguilla*), European seabass (*Moronidae: Dicentrarchus labrax*), and *Atherinidae* and *Cyprinodontidae*. These species are dominant by abundance. It is likely that the sea water pumped into the basins contains other coastal fish species. As salinity increases (beyond 100 ‰) in basins and channels, only eels and killifish (*Aphanius fasciatus*) can be found. With further increases in salinity, only killifish (*Aphanius fasciatus*) remain. For a short time they can survive salinity over 250 ‰. Thus, they may also be found in basins where crystallisation of salt begins.

## RIBE

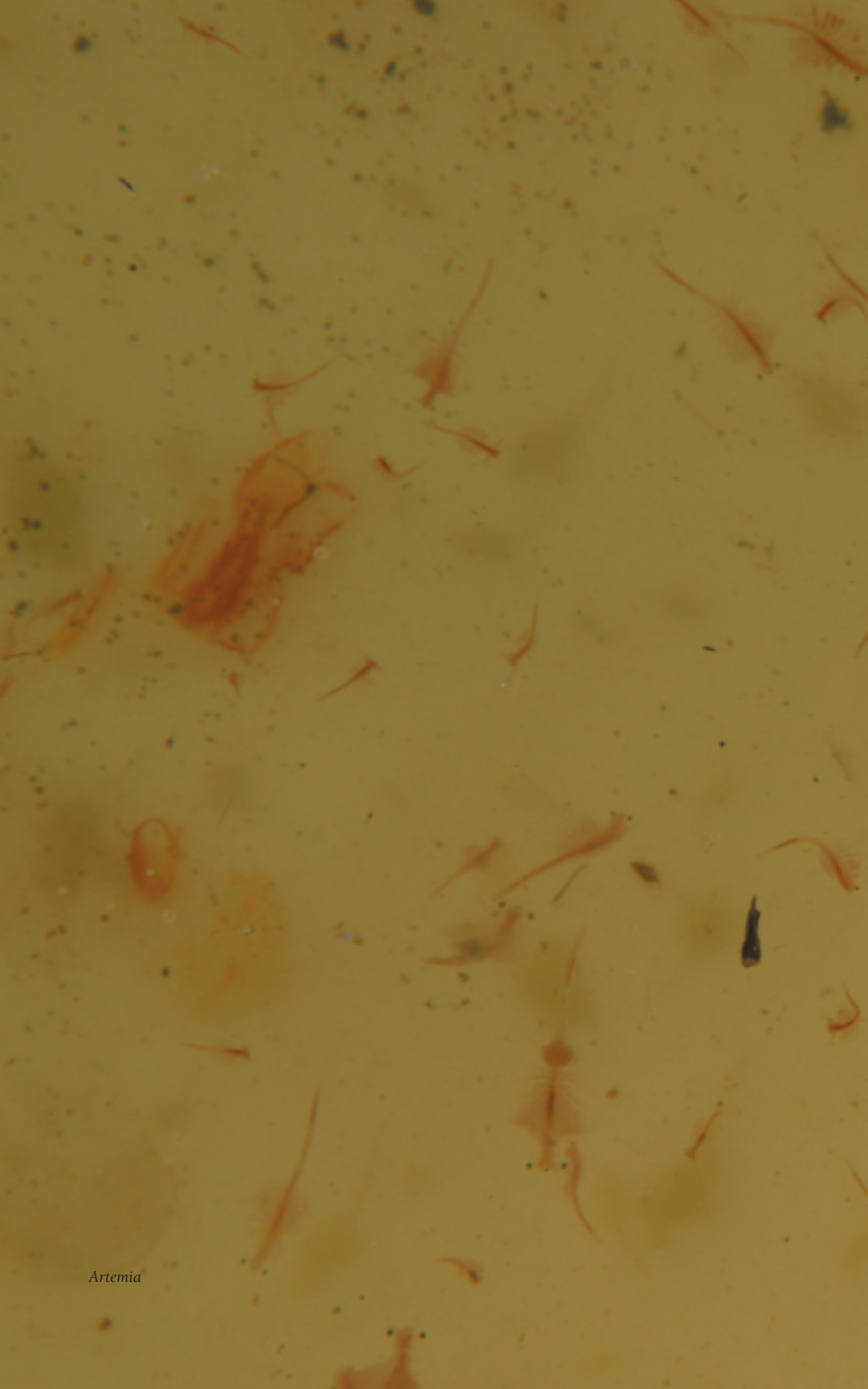
Solana je zatvoren sistem i ne postoji mogućnost da ribe iz okolnih kanala uplivaju u solanske bazene. Njihovo prisustvo moguće je ako pređu nasipe bazena, što može jedino jegulja, ili da dođu direktno iz mora upumpavanjem: jake pumpe koje napajaju Solanu vodom iz mora upumpavaju uglavnom jaja, larve ili mlađ morskih organizama. Svaki malo duži organizam biva iskomadan propelama pumpi. Ovo se dešava u aprilu, kada počinje proces proizvodnje i kada počinje upumpavanje na stotine hiljada kubika morske vode. Pumpama unešene životinje razvijaju se u bazenima sve do juna mjeseca, kada voda počinje naglo da se zagrijava a kiseonika u vodi biva sve manje. Neke se vrste, kao što je jegulja, zakopavaju u muljevito dno i čekaju prvu povoljnu priliku za dalji razvoj, a druge ugibaju ili na samoj površini vode, pokušavajući da uzmu vazduh, postaju lak plijen hiljadama ptica.

Zavisno od saliniteta vode u pojedinim bazenima, u Solani je do sada registrovano 23 vrste riba. U bazenima čiji je salinitet jednak morskom i koji zauzimaju najveću površinu Solane registruju se ekonomski značajne vrste skakavica ili cipola (*Mugilidae: Liza ramada, Liza saliens, Liza aurata*, *Chelon labrosus*, *Mugil cephalus)*, jegulje (*Anguillidae: Anguilla anguilla*), brancini (*Moronidae: Dicentrarchus labrax*), te *Atherinidae* i *Cyprinodontidae*. One dominiraju po brojnosti. Sasvim je vjerovatno da se prilikom ubacivanja morske vode u solanske bazene može naći još po neka priobalna morska vrsta riba. Sa povećanjem saliniteta (preko 100‰), u bazenima i kanalima se uglavnom srijeću samo cipoli, jegulja i solinarka *Aphanius fasciatus*. Sa daljim povećavanjem saliniteta, od riba ostaje samo solinarka *Aphanius fasciatus*, koji kraće vrijeme može da podnese i salinitete preko 250 ‰. Dakle, ona se može naći i u bazenima u kojima već dolazi do kristalizacije soli.

## CRUSTACEAN - BRINE SHRIMP - SALAMURSKI RAČIĆ *(Artemia sp.)*

Brine Shrimp are recorded in 500 natural and artificial salt lakes in the world. Although they survive in very salty water, they do not exist everywhere, primarily due to the fact that they cannot spread over the sea since they have no defence mechanisms against predators. Thanks to several types of haemoglobin, they survive in waters of all salinities. Brine Shrimp are used in food and the pharmaceutical industry. Research confirmed that in 1999 there were more than 24 tonnes of this shrimp.

Salamurski račić je registrovan na oko 500 prirodnih ili vještačkih slanih jezera na svijetu. Iako izdržava u jako slanoj vodi, nema ga svugdje, prvenstveno zbog činjenice da se njegov areal ne može širiti morem obzirom da nema nikakvih odbrambenih mehanizama protiv predatora. Zahvaljujući postojanju više vrsta hemoglobina, on može opstati u vodama svih saliniteta. Salamurski račić se koristi u prehrambenoj i farmaceutskoj industriji. Istraživanjima je utvrđeno da je na Solani 1999. godini bilo nešto više od 24 tone ovog račića.



*Artemia*

## MAMMALS

The whole Ulcinj area is unique, not just because of birds but also due to the large number of other animal species. The presence of otters, foxes, rabbits and jackals using Ulcinj Salina as their habitat shows its high value. Otters, which are nearly extinct from other habitats in Montenegro, are a distinct feature. Ulcinj Salina is one of the most important feeding places for bats on the Montenegrin coast.

## INSECTS

So far this group has not been seriously explored in Ulcinj Salina, but large fluctuations of insectivore birds have been recorded. Some insects, such as *Oecanthus pellucens*, *Pteronemobius heydenii*, *Xya cf. variegata*, *Anacridium aegyptiacum* and *Locusta migratoria* are often present on dikes. Butterflies (*Lepidoptera*) are numerous in summer. Dragonflies (*Odonata*) are mainly found near channels or halophyte vegetation. However, keeping in mind the large areas under water, dikes and large vegetation cover, great diversity of ground and water insects is expected.

*Aeshna cyanea*

*Calopterih virgo*

## SISARI

Cijelo ulcinjsko primorje jedinstveno je ne samo po pticama, već i po velikom broju predstavnika drugih životinjskih grupa. Prisustvo vidre, lisice, zeca i šakala koji Solanu koriste kao svoje stanište, pokazuje njenu visoku vrijednost. Posebnost je vidra, koja je pred nestajanjem na ostalim vodenim staništima u Crnoj Gori. Solana je jedno od najznačajnijih hranilišta slijepih miševa na crnogorskoj obali.

## INSEKTI

Do sada ova grupa na Solani nije ozbiljnije istraživana ali su primijećene velike fluktuacije broja insektivornih ptica. Neki od njih kao *Oecanthus pellucens*, *Pteronemobius heydenii*, *Xya cf. variegata*, *Anacridium aegyptiacum* i *Locusta migratoria* su značajno prisutni na nasipima. Tokom ljeta, brojni su i leptiri (*Lepidoptera*). Vili konjici (*Odonata*) uglavnom su vezani za kanale ili halofitnu vegetaciju. Ipak, računajući na velike površine pod vodom i nasipima i veliku vegetacionu pokrovnost, za o čekivati je veliki diverzitet kopnene i vodene faune insekata.

*Sympethrum meridionale*

*Somatochlora metalica*

# Glossary - Rječnik

## B

BRACKISH WATER
Water more salty than fresh water, but not as salty as sea water, containing 0.5 - 30 g/l of salt.

BRAKIČNA/BOČATA VODA
Slanija voda od slatke vode, ali ne slana kao morska. Sadrži 0.5 - 30 gr/l soli.

BERN CONVENTION
Convention on protection of wild flora and fauna and their habitats.

BERNSKA KONVENCIJA
Konvencija o zaštiti divlje flore i faune i njihovih staništa.

BRINE
Ultra-salty water (brine) containing approx. 50 g/l of salt.

SALAMURA
Ultra slana voda (brine) koja sadrži oko 50 gr.

## F

FRESH WATER
Water with less than 0.5 g/l of salt.

SLATKA VODA
Voda sa manje od 0.5 gr/l soli.

## I

IBA

Area of international importance for birds.

Područje od međunarodnog značaja za boravak ptica

IWC

International winter census of birds organised by Wetlands International

Međunarodni program zimskog prebrojavanja ptica oraganizovan od Wetlands International

IUCN

International Union for the Conservation of Nature.

Svjetska unija za zaštitu prirode.

## R

RAMSAR CONVENTION
Convention recognizing water habitats of international importance, signed in Ramsar, Iran, in 1971.

RAMSARSKA KONVENCIJA
Konvencija koja prepoznaje vodena staništa od međunarodnog značaja potpisana u Ramsaru, Iran, 1971.

RESTING PLACE
Place where birds rest during migration.

ODMARALIŠTE
Mjesto gdje ptice odmaraju.

## S

SALINA
Artificial wetland developed for salt production for economic reasons. In English, also called salt ponds, solar saltworks, saltpans etc.

SOLANA
Močvara koja je od čovjeka preuređena u područje za proizvodnju soli iz ekonomskih razloga. Na engleskom ima više sinonima: salt ponds, solar saltworks, saltpans.

SALT WATER
Water with high salt concentration containing 30-50 g/l of salt.

SOLANSKA VODA
Voda sa značajnom koncentracijom soli. Ona sadrži od 30 - 50 gr/l soli.

SALINITY
Concentration of salt in water.

SALINITET
Koncentracija soli u void.

WADERS
Birds from the *Charadriiformes* class.

ŠLJUKARICE
Ptice iz reda Charadriiformes

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